1928

Balanced Needle Valves for Echo, Gibson, and Coolidge Dams

U.S. Department of the Interior, Bureau of Reclamation

Specifications No. 480

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

INVITATION FOR BIDS, SCHEDULE
SPECIFICATIONS, AND DRAWINGS

BALANCED NEEDLE VALVES FOR ECHO GIBSON, AND COOLIDGE DAMS

SALT LAKE BASIN PROJECT, UTAH
SUN RIVER PROJECT, MONTANA
SAN CARLOS PROJECT, ARIZONA
(U. S. Indian Irrigation Service)

Bids will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 3 o'clock p. m., August 15, 1928.

CONTENTS

Standard Form No. 30

Approved by the President
June 10, 1927

STANDARD GOVERNMENT FORM OF INVITATION FOR BIDS

(SUPPLY CONTRACT)

JULY 6, 1928.

SEALED BIDS (single) will be received in this office until the date and hour named in the accompanying schedules and then publicly opened for furnishing the materials and supplies called for therein.

Bids must be submitted upon the Standard Government Form of Bid (Standard Form No. 31), and in accordance with the Standard Government Instructions to Bidders (Standard Form No. 22) and any special instructions supplementary thereto.

Envelopes containing bids must be sealed and marked on the upper left-hand corner with the name and address of the bidder and the date and hour of opening and addressed to the purchasing agency named below:

Chief Engineer,
Bureau of Reclamation,
Denver, Colorado.

Guaranty will be required with each bid in an amount not less than ten (10) per cent of the total price bid.

Performance bond will be required in an amount not less than fifty (50) per cent of the estimated aggregate payments to be made under the contract.

Standard Form No. 31

Approved by the President
June 10, 1927

STANDARD GOVERNMENT FORM OF BID

(SUPPLY CONTRACT)

Opening Date for this Bid

3 o'clock p. m., August 15, 1928

To CHIEF ENGINEER,
Bureau of Reclamation,
Denver, Colorado.

PLACE _____

DATE _____

In compliance with your invitation for bids to furnish materials and supplies listed on the reverse hereof or on the accompanying schedules, numbered:

the undersigned,

a corporation organized and existing under the laws of the State of

a partnership consisting of

an individual trading as

of the city of
hereby proposes to furnish, within the time specified, the materials and supplies at the prices stated opposite the respective items listed on the Schedules and agrees upon receipt of written notice of the acceptance of this bid within _____ days (60 days if no shorter period be specified) after the date of opening of the bids, to execute, if required, the Standard Government Form of Contract (Standard Form No. 32) in accordance with the bid as accepted, and to give bond, if required, with good and sufficient surety or sureties, for the faithful performance of the contract, within 10 days after the prescribed forms are presented for signature.

Discount will be allowed for prompt payment as follows: 10 calendar days _____ per cent; 20 calendar days _____ per cent; 30 calendar days _____ per cent; or as stated in the schedules.

(Time will be computed from date of the delivery of the supplies to carrier when final inspection and acceptance are at point of origin, or from date of delivery at destination or port of embarkation when final inspection and acceptance are at those points, or from date correct bill or voucher properly certified by the contractor is received if the latter date is later than the date of delivery.)

_____ (Witness to signature)

_____ (Full name of bidder)

_____

_____ (Address)

NOTE.—See Standard Government Instructions to Bidders and copy of the Standard Government Form of Contract, Bid Bond, and Performance Bond, which may be obtained upon application.

To insure prompt payment bills should be certified as follows: "I certify that the above bill is correct and just and that payment therefor has not been received."

SCHEDULE

Item No.	Articles or services	Quantity	Unit	Unit price	Amount	
					Dollars	Cents
	Valves for Echo Dam					
1	60-inch internal differential needle valves, long-body type with stand control, with "H"=8 feet 8 inches (see drawing No. 100–D–418), complete in accordance with the attached specifications and drawings (see paragraph 8 for list of drawings for 60-inch internal differential needle valves, long-body type) The bidder agrees to deliver the valves under item 1, f. o. b. cars, at _____ within _____ calendar days after receipt of written notice of acceptance of this bid. The approximate shipping weight of the valves under item 1 will be _____ pounds.	2	1			
	Valves for Gibson Dam					
2	60-inch internal differential needle valves, short-body type, with stand control, with "H"=8 feet 0 inches (see drawing No. 100–D–420), complete in accordance with the attached specifications and drawings (see paragraph 8 for list of drawings for 60-inch internal differential needle valves, short-body type) The bidder agrees to deliver the valves under item 2, f. o. b. cars, at _____ within _____ calendar days after receipt of written notice of acceptance of this bid. The approximate shipping weight of the valves under item 2 will be _____ pounds.	2	1			
	Valves and conduit connections for Coolidge Dam					
3	60-inch internal differential needle valves, long-body type, with stand control, with "H"=7 feet 0 inches (see drawing No. 40–D–418), and cast-iron circular conduit connections, complete in accordance with the attached specifications and drawings (see paragraph 8 for list of drawings for 60-inch balanced needle valves and conduit connections for Coolidge Dam) as follows: 2 60-inch internal differential needle valves, long-body type, with stand control 2 72-inch circular conduit connections	Lot.				

(Continued on 1 sheet of Standard Form 36.)

Standard Form No. 36

Approved by the President
June 10, 1927

STANDARD GOVERNMENT FORM OF CONTINUATION SCHEDULE FOR STANDARD FORM 31 OR 33

(SUPPLIES)

Item No.	Articles or services	Quantity	Unit	Unit price	Amount	
					Dollars	Cents
	The bidder agrees to deliver the materials under item 3, f. o. b., cars at _____ within _____ calendar days after receipt of written notice of acceptance of this bid. The approximate shipping weight of the material under item 3 will be _____ pounds.					
	Combination bids					
	Combination bids for any two or more items should be given below:					
	1. Items _____ and _____, f. o. b. cars, at above delivery points for the lump sum of _____ _____ dollars (Words) $_____.					
	2. Items _____ and _____, f. o. b. cars, at above delivery points for the lump sum of _____ _____ dollars (Words) $_____.					
	Delivery—Urgency of.—Delivery of materials is important and is desired as follows: Item 1. Valves for Echo Dam, 200 calendar days, Item 2. Valves for Gibson Dam, 100 calendar days, Item 3. Valves and conduit connections for Coolidge Dam, 100 calendar days, after receipt of written notice of acceptance of bids, and all bids specifying delivery within said number of days for any item will be considered on an equal basis as regards time of delivery. Where the time of delivery specified by the bidder for any item is greater than the number of days requested herein for said item, each day in excess thereof will be evaluated at twenty dollars ($20), and bids will be compared on this basis.					

SPECIFICATIONS

GENERAL CONDITIONS

1. Performance bond.—Unless another sum is specified in the invitation for bids, the contractor shall furnish bond in an amount not less than 20 per cent of the estimated aggregate payments to be made under the contract. Bonds in amounts of $1,000 or less will be made in multiples of $100; in amounts exceeding $1,000 but not exceeding $5,000, in multiples of $500; in amounts exceeding $5,000, in multiples of $1,000: *Provided*, That the amount of the bond shall be fixed by the contracting officer at the lowest sum that fulfills all conditions of the contract.

2. Shipment.—Material or machinery furnished and delivered f. o. b. cars at factory shipping point shall be shipped on Government bills of lading furnished by the contracting officer. The contractor shall prepare all materials and articles for shipment in such manner as to protect them from damage in transit, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment. Where necessary, heavy parts or machines shall be mounted on skids or crated, and any articles or materials that might otherwise be lost shall be boxed or wired in bundles and plainly marked for identification.

3. Extras.—The contractor shall, when ordered in writing by the contracting officer, perform extra work and furnish extra material, not covered by the specifications or included in the schedules, but forming an inseparable part of the work contracted for. Extra work and material will ordinarily be paid for at a lump sum or unit price agreed upon by the contractor and the contracting officer and stated in the order. Whenever, in the judgment of the contracting officer, it is impracticable, because of the nature of the work or for any other reason, to fix the price in the order, the extra work and material shall be paid for at actual necessary cost as determined by the contracting officer, plus 15 per cent for superintendence, general expense, and profit. The actual necessary cost will include all expenditures for material, labor, and supplies furnished by the contractor, and a reasonable allowance for the use of his plant and equipment, where required, to be agreed upon in writing before the work is begun, but will in no case include any allowance for office expenses, general superintendence, or other general expenses.

4. Failure of Congress to appropriate funds.—If the operations of this contract extend beyond the current fiscal year, it is understood that the contract is made contingent upon Congress making the necessary appropriation for expenditures thereunder after such current year has expired. In case such appropriation as may be necessary to carry out this contract is not made, the contractor hereby releases the Government from all liability due to the failure of Congress to make such appropriation.

5. Patents.—The contractor shall hold and save the Government, ifs officers, agents, servants, and employees harmless from liability of any nature or kind for or on account of the use of any patented or unpatented invention, article, or appliance furnished or used in the performance of this contract, excepting patented articles required by the Government in its specifications, the use of which the contractor does not control.

SPECIAL CONDITIONS

6. The requirement.—It is required that there be furnished and delivered, f. o. b. cars at the factory shipping point, complete in accordance with these specifications and attached drawings, six 60-inch internal differential needle valves. Two valves of the long-body type will be installed in Echo Dam, Salt Lake Basin project, Utah; two valves of the short-body type in Gibson Dam, Sun River project, Montana; and two valves of the long-body type, with two sections of 72-inch circular conduit in Coolidge Dam, San Carlos project, United States Indian Irrigation Service, Arizona. All valves will be installed by the Government.

7. Description of valves.—The valves will be used to regulate the discharge of irrigation water from reservoirs under heads up to 164 feet, and will be properly protected by emergency gates to permit inspection or repairs. The design of the valves is shown on drawings Nos. 40–D–418 and 40–D–420. Operation is by means of the regulation of pressures within the interior body whereby differential pressures are created on opposite sides of stationary and movable pistons for moving the plunger to open or close the valve, and by so balancing these internal pressures that the plunger will remain stationary at any desired position for regulation of the discharge of water through the valve. Control is by means of a handwheel mounted on an operating stand. No provision is made for positive mechanical operation of the valve.

8. Drawings.—The following drawings are made a part of these specifications:

Valves for Echo Dam, Item 1

Valve—Long-body type—Stand control:

1. (*23451*) 40–D–418—General assembly—list of parts (sheet 1 of 10).
2. (*23452*) 40–D–422—Control assembly—gears—couplings (sheet 2 of 10).
3. (*23453*) 40–D–423—Layout diagram and velocity curve (sheet 3 of 10).
4. (*23454*) 40–D–425—Long body (sheet 4 of 10).
5. (*23455*) 40–D–427—Nozzle and seat retainer (sheet 5 of 10).
6. (*23456*) 40–D–428—Needle—nozzle seat—packing clamp (sheet 6 of 10).
7. (*23457*) 40–D–429—Needle head—diaphragm—control spider (sheet 7 of 10).
8. (*23458*) 40–D–430—Diaphragm tube and clamp—manifold (sheet 8 of 10).
9. (*23459*) 40–D–431—Control head—shafts and gears (sheet 9 of 10).
10. (*23460*) 40–D–432—Bolts—studs—screws—wrenches (sheet 10 of 10).

Vent stand:

11. (*23461*) 40–D–433—Assembly—list of parts—details.

Control stand:

12. (*23462*) 40–D–434—Assembly—list of parts—gears (sheet 1 of 2).
13. (*23463*) 40–D–435—Pedestal—cover—extension stems (sheet 2 of 2).

Valves for Gibson Dam, Item 2

Valve—Short-body type—Stand control:

14. (*23464*) 40–D–420—Assembly—list of parts (sheet 1 of 10).
2. (*23452*) 40–D–422—Control assembly—gears—couplings (sheet 2 of 10).
15. (*23465*) 40–D–424—Layout diagram and velocity curve (sheet 3 of 10).
16. (*23466*) 40–D–426—Short body (sheet 4 of 10).
5. (*23455*) 40–D–427—Nozzle and seat retainer (sheet 5 of 10).
6. (*23456*) 40–D–428—Needle—nozzle seat—packing clamp (sheet 6 of 10).
7. (*23457*) 40–D–429—Needle head—diaphragm—control spider (sheet 7 of 10).
8. (*23458*) 40–D–430—Diaphragm tube and clamp—manifold (sheet 8 of 10).
9. (*23459*) 40–D–431—Control head—shafts and gears (sheet 9 of 10).
10. (*23460*) 40–D–432—Bolts—studs—screws—wrenches (sheet 10 of 10).

Vent stand:

11. (*23461*) 40–D–433—Assembly—list of parts—details.

Control stand:

12. (*23462*) 40–D–434—Assembly—list of parts—gears (sheet 1 of 2).
13. (*23463*) 40–D–435—Pedestal—cover—extension stems (sheet 2 of 2).

Valves and conduit connections for Coolidge Dam, Item 3

Valve—Long-body type—Stand control:

1. (*23451*) 40–D–418—General assembly—list of parts (sheet 1 of 10).
2. (*23452*) 40–D–422—Control assembly—gears—couplings (sheet 2 of 10).
3. (*23453*) 40–D–423—Layout diagram and velocity curve (sheet 3 of 10).
4. (*23454*) 40–D–425—Long body (sheet 4 of 10).
5. (*23455*) 40–D–427—Nozzle and seat retainer (sheet 5 of 10).
6. (*23456*) 40–D–428—Needle—nozzle seat—packing clamp (sheet 6 of 10).
7. (*23457*) 40–D–429—Needle head—diaphragm—control spider (sheet 7 of 10).
8. (*23458*) 40–D–430—Diaphragm tube and clamp—manifold (sheet 8 of 10).
9. (*23459*) 40–D–431—Control head—shafts and gears (sheet 9 of 10).
10. (*23460*) 40–D–432—Bolts—studs—screws—wrenches (sheet 10 of 10).

Vent stand:

11. (*23461*) 40–D–433—Assembly—list of parts—details.

Control stand:

12. (*23462*) 40–D–434—Assembly—list of parts—gears (sheet 1 of 2).
13. (*23463*) 40–D–435—Pedestal—cover—extension stems (sheet 2 of 2).

Conduits:

17. (*23467*) 44–D–58—72-inch conduit connection.

Certain drawings are duplicated in the above lists. These duplicated drawings apply to the valves under the respective items, but only one copy of each drawing is included in these specifications. The contractor will not be held responsible for the correctness or sufficiency of designs, but he shall carefully check the drawings and advise the contracting officer of any errors or omissions discovered by him. The contractor shall prepare, without charge to the Government, all necessary shop drawings covering the materials to be furnished under these specifications and he shall be responsible for the correct fitting of all the parts. Unless otherwise specifically provided in the specifications or on the drawings, the contractor shall furnish all of the materials, accessories, and appurtenant parts called for in the specifications or shown on the drawings. Anything called for on the drawings and not mentioned in the specifications, or called for in the specifications and not mentioned in the drawings, shall be furnished the same as if called for or mentioned in or on both. Such additional copies of the specifications and complete sets of blue prints from original tracings as are necessary for carrying on the work will be furnished to the contractor.

9. Liquidated damages.—The article, "Delays—Liquidated damages," given in paragraph 5 of the directions for preparation of contract, Standard Government form of Contract (Standard Form No. 32), will by this reference be substituted for article 5 of the contract. This article reads as follows:

> "*Article ____ Delays—Liquidated damages.*—If the contractor refuses or fails to make delivery of the materials or supplies within the time specified in Article 1, or any extension thereof, the actual damage to the Government for the delay will be impossible to determine, and in lieu thereof the contractor shall pay to the Government, as fixed, agreed, and liquidated damages for each calendar day of delay in making delivery, the amount as set forth in the specifications or accompanying papers, and the contractor and his sureties shall be liable for the amount thereof: *Provided, however,* That the Government reserves the right to terminate the right of the contractor to proceed and to purchase similar material or supplies in the open market or secure the manufacture and delivery thereof by contract or otherwise, charging against the contractor and his sureties any excess cost occasioned the Government thereby, together with liquidated damages accruing until such time as the Government may reasonably procure similar material or supplies elsewhere: *Provided further,* That the contractor shall not be charged with liquidated damages or any excess cost when the delay in delivery is due to unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God or the public enemy, acts of the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather but not including delays caused by subcontractors: *Provided further,* That the contractor shall, within ten days from the beginning of any such delay, notify the contracting officer in writing of the causes of delay, who shall ascertain the facts and extent of the delay and his findings of facts thereon shall be final and conclusive on the parties hereto, subject only to appeal, within thirty days, by the contractor to the head of the department concerned, whose decision on such appeal as to the facts of delay shall be final and conclusive on the parties hereto."

The amount of liquidated damages to be charged for failure to deliver the valves under any item of the schedule within the time specified by the bidder will be twenty dollars ($20) for each calendar day of delay.

10. Payment.—Eighty-five (85) per cent of the contract price for any item of the schedule will be paid within thirty (30) days after receipt by the Bureau of Reclamation, Denver, Colorado, of proper invoices and Government bills of lading, properly receipted, covering complete shipment of the material under said item. Earlier payment may be made if a discount is allowed as provided for in Standard Government Form of Bid (Standard Form No. 31). When all of the material has been received at the railway destination, checked, and accepted by the contracting officer, final payment will be made of the balance due under the contract.

11. Preference for domestic articles or materials.—Preference will be given to articles or materials of domestic production, conditions of quality and price, including duty, being equal. Unless otherwise stated in the bid it will be understood that domestic articles or materials only will be used, and the use of foreign articles or materials will not be permitted unless (1) they are of better quality, or (2) being equal in quality, will be furnished at lower cost to the Government, or (3) domestic articles or materials are not available. The term "domestic articles or materials" in this connection means articles or materials manufactured or assembled in the United States or its possessions.

CONSTRUCTION

12. Patterns.—The prices bid in the schedule shall include the cost of all necessary patterns. Care shall be taken to avoid sharp corners or abrupt changes in cross section by the use of ample fillets. Patterns will remain the property of the contractor.

13. Finish for castings.—All castings shall be true to pattern, free from cracks, cold shuts, excessive shrinkage, and other injurious defects. No porosity will be allowed in positions where the strength of the casting will be impaired. All sand shall be removed before the castings are machined and painted.

14. Tolerances and machine work.—Tolerances and clearances specified on the drawings shall be closely adhered to, and the machine work shall be carefully performed, with surfaces smooth and practically free from tool marks. Where tolerances are not specified on the drawings, the contractor shall follow the best modern shop practice for apparatus of the type covered by these specifications, due consideration being given to the special nature or functions of any parts, and to the corresponding accuracy required to secure proper operation.

15. Shop assembly and test.—Before shipment each valve shall be completely assembled in the shop for inspection and test. All moving parts of the control mechanism shall be carefully machined and fitted, and shall move freely throughout their full operation without binding, to the satisfaction of the contracting officer. After complete assembly each valve shall be subjected to a hydraulic test pressure of 150 pounds per square inch. Under this test pressure there shall be practically no leakage from the bolted flanged joints, and the leakage past the seat in the nozzle shall not exceed 10 gallons per minute. Test heads and any other appurtenances required for testing shall be furnished by the contractor and included in the prices bid. The parts of each valve shall be marked and match-marked for identification and to facilitate assembly in the field.

16. Painting.—All unfinished surfaces on the outside of the valves shall be given one shop coat of first class black machinery paint. All unfinished surfaces on the inside of the valves shall be coated with one coat of water-gas tar, followed by one coat of coal-gas tar, or, at the option of the contractor, two coats of an equivalent high grade refined pitch-tar paint satisfactory to the contracting officer may be substituted for the water and coal-gas tar. All finished surfaces shall be covered with a heavy rust-preventive compound.

17. Preparation for shipment.—After the valves have been tested in accordance with the contract and accepted by the inspector, they shall be dismantled for shipment. All heavy parts shall be properly mounted on timber skids, and all small loose parts shall be boxed for shipment, in a manner satisfactory to the contracting officer.

18. Federal Specifications Board specifications.—Copies of the Federal Specifications Board specifications referred to herein, may be procured at a nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C.

19. Test specimens.—The contractor shall provide, without charge to the Government, all necessary test specimens properly machined for testing, and all samples or drillings for analyses, and shall notify the contracting officer or his representative when these test specimens or samples are ready. All test specimens and samples shall be plainly marked to indicate the materials they represent and shall be properly boxed and prepared for shipment if desired.

MATERIALS

20. General specifications for metals.—Unless otherwise specifically stated herein, all metals covered by these specifications shall be furnished in accordance with the requirements of the "United States Government General Specification for Metals," Federal Specifications Board Specification No. 339, which specification covers certain requirements which are common to all detail specifications for metals and provides means for determining whether the technical requirements of the specifications and drawings are being met.

21. Semisteel.—Castings shall be made by the cupola process, free from injurious defects, and shall be smooth and well cleaned before inspection. They shall be free from hard spots and shall be annealed in a furnace, if necessary, to secure satisfactory machinability. Castings shall not be plugged or welded without permission from the inspector, and such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings. In all respects not specifically mentioned herein the castings shall conform to the "United States Government Master Specification for High-Test Gray Iron Castings (Semisteel)," Federal Specifications Board Specification No. 140. There shall be three classes of semisteel castings, as follows:

(*a*) *Light castings*, having a section less than one-half inch in thickness.

(*b*) *Medium castings*, falling between the other two classes.

(*c*) *Heavy castings*, having no section less than 2 inches in thickness.

The castings shall be of such a character that transverse test bars 1¼ inches in diameter and 15 inches long, placed on supports 12 inches apart, will have physical properties not less than the following:

Class	Load at center	Deflection at center	Tensile strength
	Pounds	*Inches*	*Pounds per square inch*
Light castings	3, 500	0. 12	26, 000
Medium castings	3, 700	0. 12	28, 000
Heavy castings	3, 900	0. 12	30, 000

Two sets (two bars per set) of transverse test bars shall be cast from each melt, one set from the first and the other set from the last iron going into the castings. Each set of two bars shall be cast in a single mold. Tension tests will not be required.

22. Cast steel.—Steel castings shall be sound and free from injurious defects. They shall be well cleaned, with heads and gates removed for inspection in the green. When heads and gates are removed by burning, this burning shall be done at least one-half inch from the body of the casting, the remaining metal to be removed by grinding, cutting, or machining. Castings shall not be repaired, plugged, or welded without specific authority from the inspector. Such permission will be given only for welding to be completed prior to final heat treatment, and when the defects, after being thoroughly cleaned out to sound metal, are judged not to affect the strength, use, or machinability of the castings. Castings shall be annealed in a properly constructed pit or furnace, and they shall be held at the treatment temperature at least long enough for each casting to be uniformly heated throughout its mass. They shall not be removed from the furnace until they have been cooled down to a temperature of about 700° F. Rapid cooling of castings, or any further heat treatment other than reannealing, shall not be undertaken without specific authority from the contracting officer. All castings shall be annealed so that the fracture of any part shall show to the eye a fine-grain structure. They shall be well cleaned for final inspection. In all respects not specifically mentioned herein the castings shall conform to the "United States Government Master Specification for Steel Castings (Medium Grade)," Federal Specifications Board Specification No. 170. Tension-test pieces properly machined shall be furnished by the contractor in accordance with the above specification. The physical properties shall be not less than the following:

Ultimate tensile strength	70,000 pounds per square inch.
Yield point	45 per cent of tensile strength obtained.
Elongation in 2 inches	20 per cent.
Reduction of area	30 per cent.

Cold-bend tests will not be required.

23. Steel.—Where "steel" only is specified, the contractor may use any first-class grade of commercial carbon steel best suited for the purpose for which the part is to be used.

24. Cold-finished steel shafting.—Cold-finished steel shafting shall conform in all respects to the current "Standard Specifications for Commercial Bar Steels" of the American Society for Testing Materials. It shall be made of cold-finished bars, turned and polished, open-hearth grade, 20–30 carbon.

25. Bolt steel.—All steel rods from which bolts and studs are made shall be clean, straight, and of uniform quality and size. The physical properties of the steel from which bolts and studs are made shall be not less than the following:

Material	Ultimate tensile strength	Yield point	Elongation in 8 inches
Bolt steel:	*Pounds per square inch*	*Pounds per square inch*	*Per cent*
Class "A"	75, 000	40, 000	23
Class "B"	58, 000	30, 000	28
Class "C"	Commercial grade.		

26. Finish for bolts, studs, and nuts.—Bolts, studs, and nuts will be of two classes—semifinished and finished, as follows:

(*a*) Semifinished bolts and nuts shall be die chamfered, machined under head and nut, threaded, with the head of the bolt concentric with the body, and the faced side at right angles to the body.

(*b*) Finished bolts, studs, and nuts shall be machined throughout, threaded, with head chamfered, concentric with and at right angles to the body of the bolt.

27. Bronze castings.—Bronze castings shall be made only from the best grades of virgin metals. The use of scrap metal will not be allowed. They shall be of uniform quality free from blowholes, porosity, hard spots, shrinkage defects, cracks, or other injurious defects, and shall be smooth and well cleaned before inspection. Castings shall not be repaired, plugged, or welded without permission from the inspector. Such permission will be given only when the defects are small and do not adversely affect the strength, use, or machinability of the castings.

28. Bronze.—Where "bronze" only is specified on the drawings, except for nuts, the castings may be made of either grade No. 5 or grade No. 6 bronze. In all respects not specifically mentioned herein bronze castings shall conform to the "United States Government Master Specification for Bronze Castings," Federal Specifications Board Specification No. 172a. The physical properties of the bronze castings shall be not less than the following:

Grade	Ultimate tensile strength	Yield point (tensile strength)	Elongation in 2 inches
	Pounds per square inch	*Pounds per square inch*	*Per cent*
5	40, 000	0. 5	20
6	35, 000	. 5	18

Chemical analysis shall show:

Elements	Composition	Grade 5	Grade 6
		Per cent	*Per cent*
Copper	Desired	88	88
	Permissible	86 –89	85 –89
Tin	Desired	8	8
	Permissible	7. 5–11	7. 5–11
Zinc	Desired	4	4
	Permissible	1. 5– 4. 5	1. 5– 4. 5
Lead	Desired	0	0
	Permissible	0– 0. 3	0– 1. 0
Iron	Desired, maximum	0	0
	Permissible, maximum	0. 1	0. 25
Nickel	Desired, maximum		
	Permissible, maximum	0. 75	0. 75
Phosphorus	Desired, maximum	0	0
	Permissible, maximum	0. 05	0. 50
Sulphur	Desired, maximum	0	0
	Permissible, maximum	0. 05	0. 05
Antimony	Desired, maximum	0	0
	Permissible, maximum	0. 25	0. 25
Other elements	Desired, maximum	0	0
	Permissible, maximum	0. 15	0. 35

29. Cast manganese bronze.—In all respects not specifically stated herein, cast manganese bronze shall conform to the "United States Government Master Specifications for Manganese Bronze Castings," Federal Specifications Board Specification No. 370. The physical properties of the manganese bronze castings shall be not less than the following:

Ultimate tensile strength—65,000 pounds per square inch.
Ultimate elongation in 2 inches—20 per cent.

Chemical analysis shall show:

Copper—55 to 60 per cent.
Zinc—38 to 42 per cent.
Manganese—3.5 per cent.
Aluminum—1.5 per cent.
Lead, not over—0.2 per cent.
Other elements—0.2 per cent.

The remainder may be of such small percentages of other ingredients as the contractor considers necessary to produce the specified physical properties.

30. Rolled bronze.—The physical properties of rolled bronze shall be not less than the following:

Ultimate tensile strength—60,000 pounds per square inch.
Yield point—30,000 pounds per square inch.
Elongation in 2 inches—30 per cent.

31. Special gear bronze.—The gate stems shall be made from rolled or forged bronze having physical properties not less than the following:

Ultimate tensile strength—90,000 pounds per square inch.
Yield point—50,000 pounds per square inch.
Elongation in 2 inches—20 per cent.

32. High tensile bronze.—High tensile bronze shall be a rolled or forged bronze having physical properties not less than the following:

Ultimate tensile strength	90,000 pounds per square inch.
Yield point	50,000 pounds per square inch.
Elongation in 2 inches	20 per cent.

33. Miscellaneous materials.—Where materials are specified on the drawings, but are not specifically covered herein by detail specifications, the contractor shall furnish high class commercial grades of materials or articles that are satisfactory to the contracting officer.

U. S. GOVERNMENT PRINTING OFFICE: 1927

LIST OF PARTS - ONE VALVE

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED	DRAWING NUMBER
1	Long Body	Semisteel	1	40-D-425
2	Nozzle	Semisteel and Bronze	1	40-D-427
3	Needle Guide	Rolled Bronze	8	" "
4	Seat Retainer	Cast Steel	1	" "
5	Needle	Cast Manganese Bronze	1	40-D-428
6	Needle Tip	Semisteel and Bronze	1	" "
7	Needle Ring	Bronze	1	" "
8	Packing Clamp	Mild Steel	1	" "
9	Nozzle Seat	Cast Manganese Bronze	1	" "
10	Indicator Rack	High Tensile Bronze	1	" "
11	Control Spear	Brass	1	" "
12	Needle Head	Semisteel and Bronze	1	40-D-429
13	Diaphragm	Semisteel	1	" "
14	Control Spider	Semisteel and Bronze	1	" "
15	Outlet Head	Semisteel	1	" "
16	Diaphragm Tube	Cast Manganese Bronze	1	40-D-430
17	Diaphragm Clamp	Cast Manganese Bronze	1	" "
18	Vent and Drain Manifold	Cast Manganese Bronze	1	" "
19	Tube Cover	Cast Manganese Bronze	1	" "
20	Control Crosshead	Cast Manganese Bronze	1	" "
21	Crosshead Nut	Cast Manganese Bronze	1	" "
22	Control Shaft	High Tensile Bronze	1	40-D-431
23	Indicator Shaft	High Tensile Bronze	1	" "
24	Manifold Pipe	Standard Brass Pipe	4	" "
25	Locking Ring	Spring Brass Wire	3	" "
26	Control Bevel Pinion	Special Gear Bronze	1	" "
27	Control Bevel Gear	Special Gear Bronze	1	" "
28	Rack Pinion	Special Gear Bronze	1	" "
29	Gear Nut	Mild Steel	3	" "
30	Control Head	Semisteel	1	" "
31	Speed Control Valve	Bronze	1	" "
32	Speed Control Valve Nut	Bronze	1	" "
33	Speed Control Valve Seat	Bronze	1	" "
34	Valve Nut Collar	Bronze	1	" "
35	Gland	Bronze	7	" "
36	Indicator Pointer	Brass	1	" "
37	Lock Nut	Steel	1	" "
38	Thrust Washer	Bronze	1	" "

LIST OF PARTS CONTINUED

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED	DRAWING NUMBER
39	Control Wheel	Semisteel	1	40-D-431
40	Control Wheel Washer	Mild Steel	1	" "
41	Indicator Pinion	Special Gear Bronze	1	" "
45	3/8"x1" Tap Bolt	Bolt Steel - Class "A"	3	40-D-432
46	1/2"x1" Tap Bolt	Bolt Steel - Class "A"	1	" "
47	5/8"x2 1/8" Tap Bolt	Bolt Steel - Class "A"	16	" "
48	3/4"x1 3/4" Tap Bolt	Bolt Steel - Class "A"	9	" "
49	3/4"x2" Tap Bolt	Bolt Steel - Class "A"	10	" "
50	3/4"x2 1/2" Tap Bolt	Bolt Steel - Class "A"	12	" "
51	3/4"x3 1/2" Tap Bolt	Bolt Steel - Class "A"	3	" "
52	3/4"x3 3/4" Tap Bolt	Bolt Steel - Class "A"	8	" "
53	1"x5 1/2" Tap Bolt	Bolt Steel - Class "A"	8	" "
55	5/8"x3" Stud with Nut	Bolt Steel - Class "A"	24	" "
56	5/8"x3 1/2" Stud with Nut	Bolt Steel - Cl. "A" - Bronze Nut	14	" "
57	1 1/2"x7" Stud with Nut	Bolt Steel Class "A"	56	" "
58	1/2"x1 1/2" Fillister Hd. Cap Screw	Bolt Steel Class "A"	9	" "
59	9/16"x1 1/4" Fillister Hd. Cap Screw	Rolled Bronze	72	" "
60	7/8"x2 3/4" Fillister Hd. Cap Screw	Bolt Steel Class "A"	36	" "
61	7/8"x4 7/8" Stud-Castellated Nut	Bolt Steel Class "A"	72	" "
62	1 1/2"x5 7/8" Stud-Castellated Nut	Bolt Steel Class "A"	22	" "
63	1 1/4"x14 1/4" Bolt-Castellated Nut	Bolt Steel Class "A"	2	" "
64	2"x8 3/4" Bolt-Castellated Nut	Bolt Steel Class "A"	60	" "
65	3/8"x1" Flat Head Cap Screw	Bolt Steel Class "C"	1	" "
66	1/2"x1 1/4" Flat Head Cap Screw	Bolt Steel Class "C"	12	" "
67	2" Eye Bolt	Standard Forged Steel	See Note	" "
68	Ring Packing	Garlock No.99 or equal 3/8" Sq.	20 Rings	" "
69	2 3/4" Spanner Wrench	Steel	See Note	" "
70	3 1/4" Spanner Wrench	Steel	See Note	" "
71	Crosshead Nut Wrench	Cast Steel	See Note	" "
72	Diaphragm Packing	Garlock No.99 or equal 3/8" Sq.	100 ft. long	No Detail
73	1/4" Round Gasket	Rubber	20 ft. long	No Detail
74	1/2" Round Gasket	Rubber	24 ft. long	No Detail

Note:- Furnish one each of Parts 67-69-70 and 71 for each Item of Contract regardless of the number of Valves Specified.

LIST OF DRAWINGS

VALVE - LONG BODY TYPE - STAND CONTROL

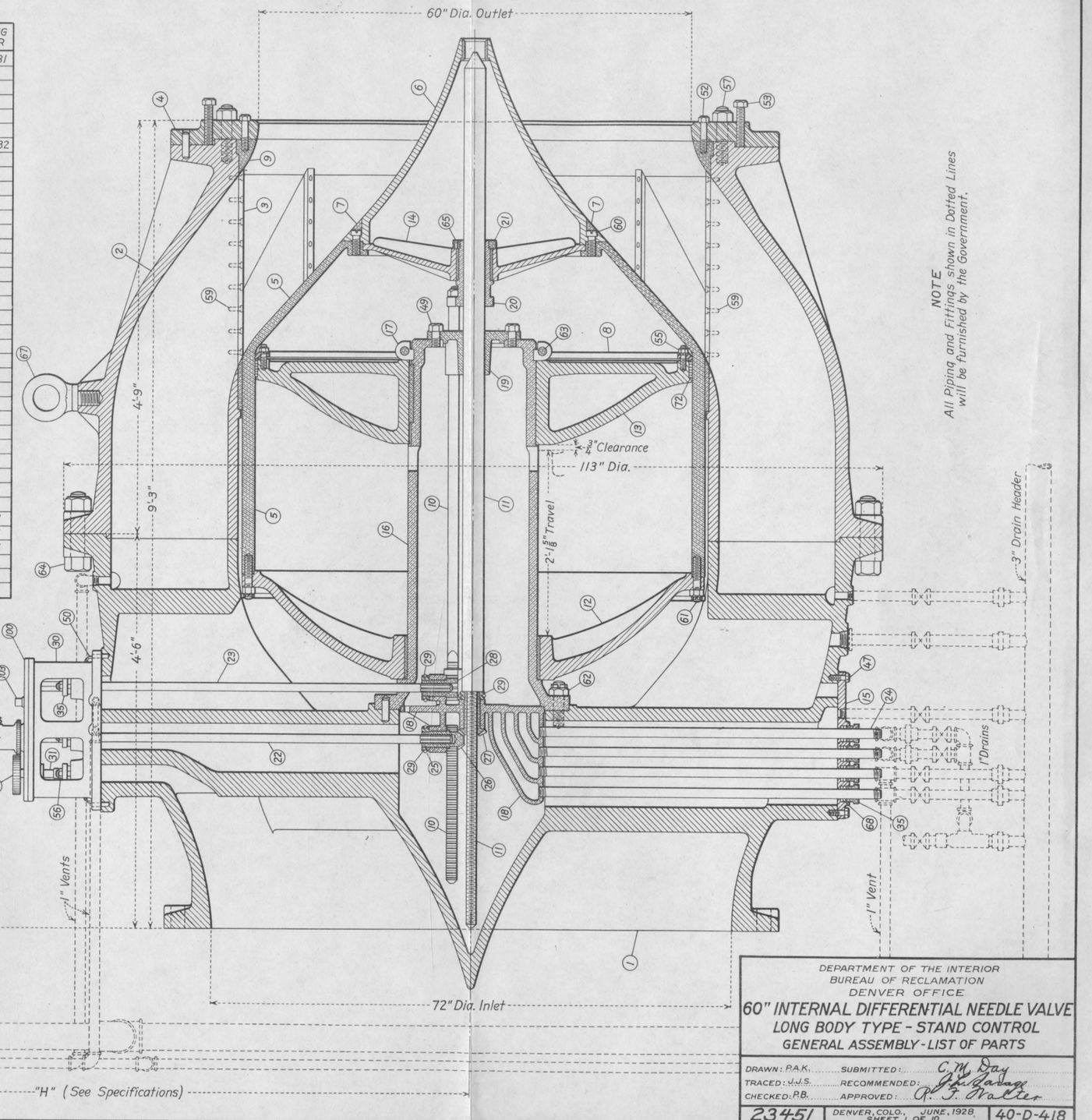
- GENERAL ASSEMBLY - LIST OF PARTS 40-D-418
- CONTROL ASSEMBLY - GEARS - COUPLINGS 40-D-422
- LAYOUT DIAGRAM AND VELOCITY CURVE 40-D-423
- LONG BODY 40-D-425
- NOZZLE AND SEAT RETAINER 40-D-427
- NEEDLE - NOZZLE SEAT - PACKING CLAMP 40-D-428
- NEEDLE HEAD - DIAPHRAGM - CONTROL SPIDER 40-D-429
- DIAPHRAGM TUBE AND CLAMP - MANIFOLD 40-D-430
- CONTROL HEAD - SHAFTS AND GEARS 40-D-431
- BOLTS - STUDS - SCREWS - WRENCHS 40-D-432

VENT STAND

- ASSEMBLY - LIST OF PARTS - DETAILS 40-D-433

CONTROL STAND

- ASSEMBLY - LIST OF PARTS - GEARS 40-D-434
- PEDESTAL - COVER - EXTENSION STEMS 40-D-435



NOTE
All Piping and Fittings shown in Dotted Lines will be furnished by the Government.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE
LONG BODY TYPE - STAND CONTROL
GENERAL ASSEMBLY - LIST OF PARTS

DRAWN: P.A.K. SUBMITTED: C.M. Day
TRACED: J.J.S. RECOMMENDED: J.L. Savage
CHECKED: P.B. APPROVED: R. J. Walter

23451 | DENVER, COLO., JUNE, 1928, SHEET 1 OF 10 | 40-D-418

Drill into square Shank for $\frac{1}{4}$" Setscrew with Gear Assembled on speed Control Valve.

PLAN

SECTION A-A

STAND CONTROL ASSEMBLY

SECTION B-B

Top of Valve

Speed Control Valve

℄ Rack

℄ Valve and Control.

℄ Valve

Control Shaft

Indicator Shaft

4-3¼"

10"

2.2187"

2¾"

1 19/32

(104) CONTROL COUPLING
STEEL - ONE REQUIRED
Finish all over

(103) COLLAR
BRASS - ONE REQUIRED
Finish all over

(105) INDICATOR COUPLING
BRASS - ONE REQUIRED
Finish all over

(102) DRIVEN PINION
SPECIAL GEAR BRONZE - ONE REQUIRED
Finish all over

(100) CONTROL COVER
SEMISTEEL - ONE REQUIRED

(106) FIRST SPEED CONTROL VALVE GEAR
BRASS ONE REQUIRED
COMPLETE WITH COLLAR AND SCREW

DETAIL H

(101) INDICATOR GEAR
SPECIAL GEAR BRONZE
ONE REQUIRED

(107) SECOND SPEED CONTROL VALVE GEAR
BRASS - ONE REQUIRED
Complete with Felt Packing

(108) COUPLING HEAD
BRASS - ONE REQUIRED
Finish all over

Drill 12-17/32" Holes and Countersink 70° included Angle for 66

Cut 45 Teeth - 10 - Dia. Pitch 20° Involute

Cut 55 Teeth - 10 - Dia. Pitch - 20° Involute

Cut 36 Teeth 16 - Dia. Pitch 14½° Involute

Cut 97 Teeth 16 - Dia. Pitch 14½° Involute

Cut 117 Teeth 16 - Dia. Pitch 14½° Involute

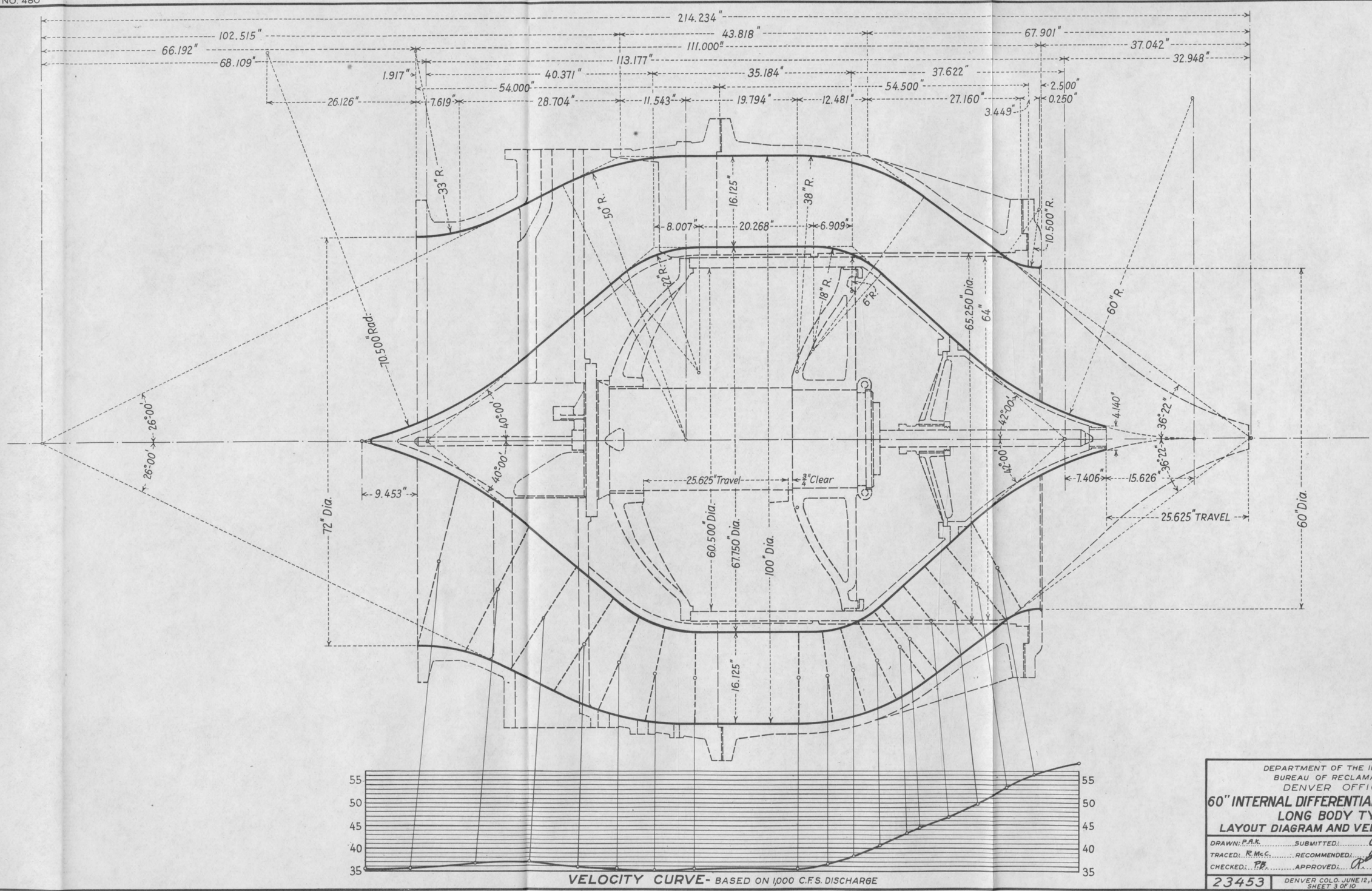
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE CONTROL ASSEMBLY-GEARS-COUPLINGS

DRAWN: P.A.K.	SUBMITTED: C.M. Day		
TRACED: A-A-A	RECOMMENDED: J.L. Savage		
CHECKED: P.B.	APPROVED: A.J. Walter		
23452	DENVER, COLORADO, JUNE, 1928 SHEET 2 OF 10		40-D-422

SPECIFICATIONS NO. 480

DRAWING NO. 3

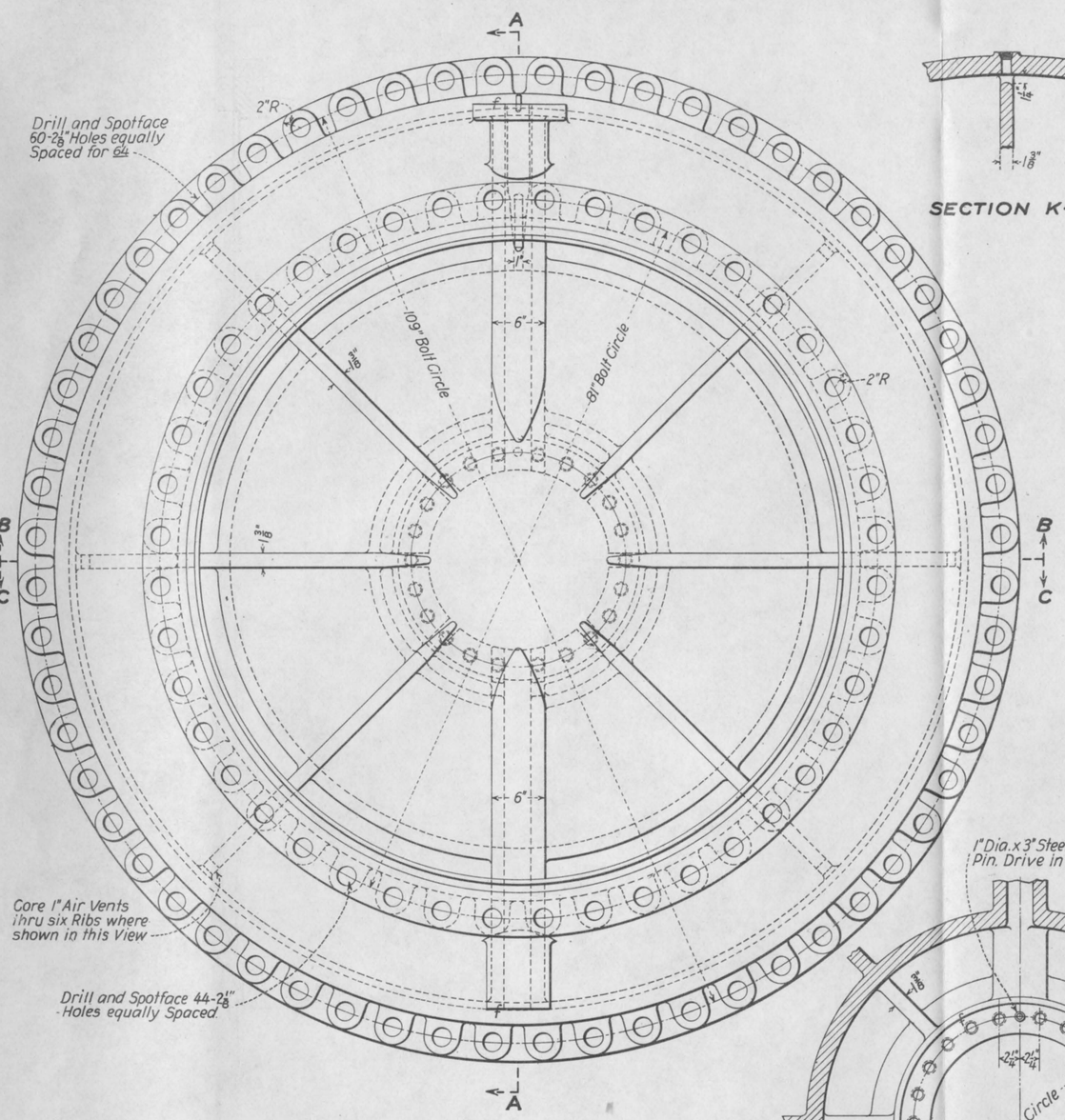


VELOCITY CURVE- BASED ON 1,000 C.F.S. DISCHARGE

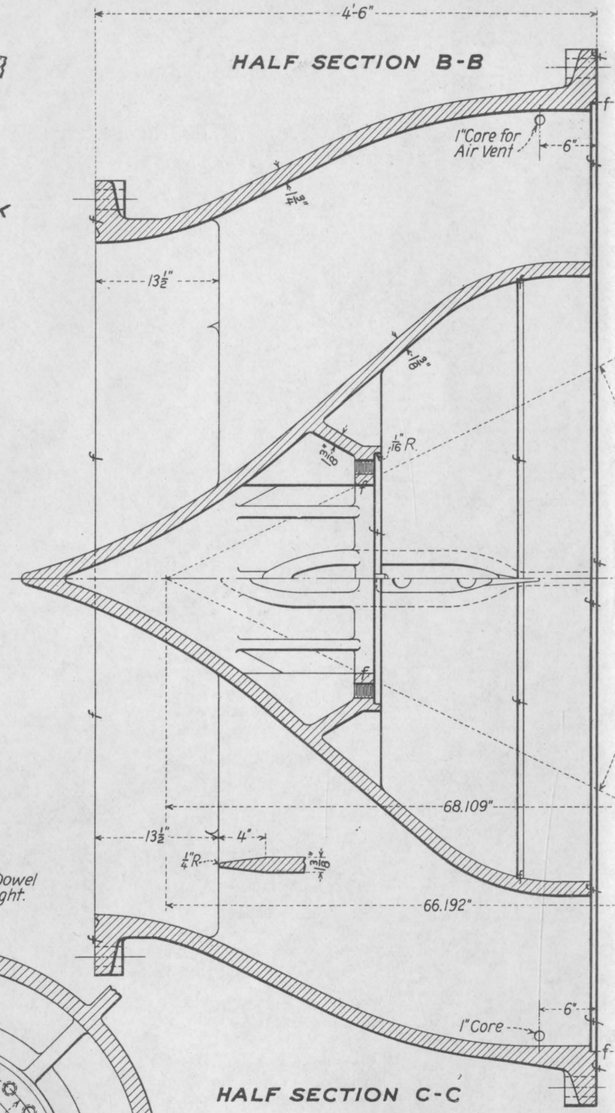
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

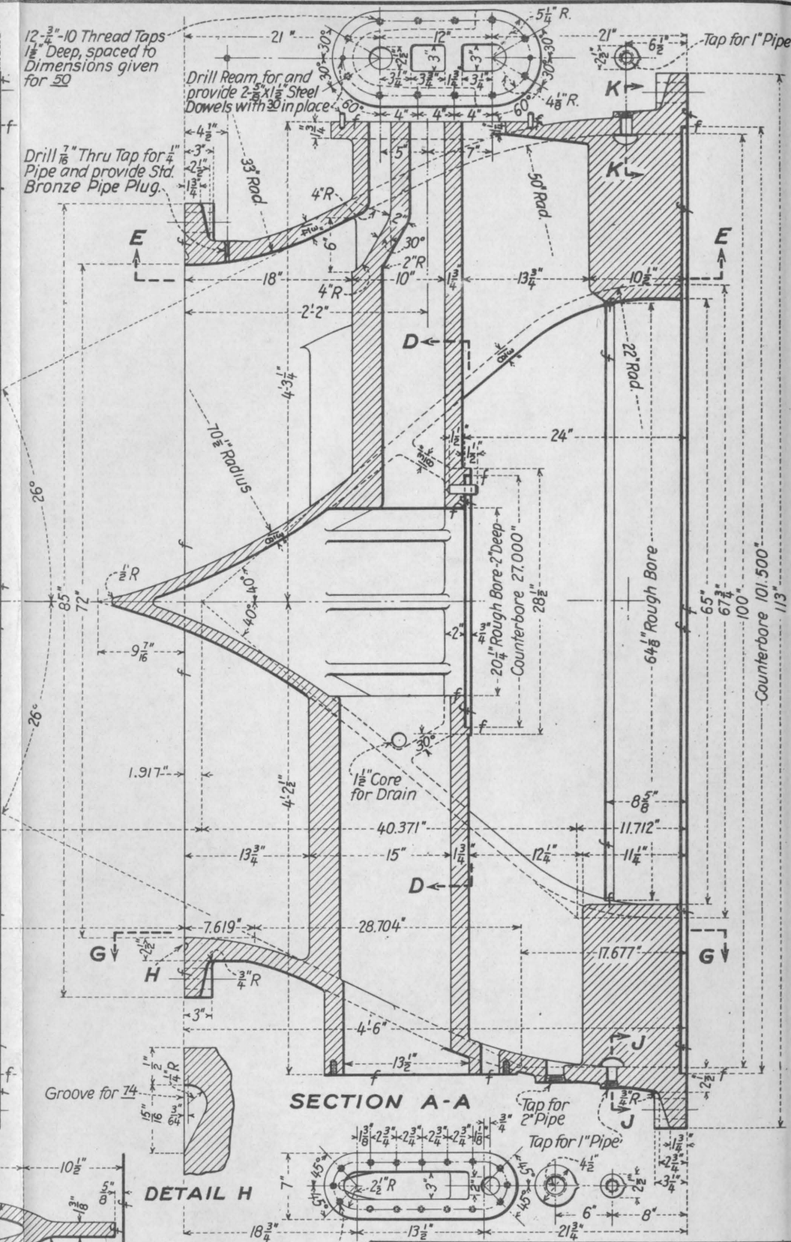
60" INTERNAL DIFFERENTIAL NEEDLE VALVE
LONG BODY TYPE
LAYOUT DIAGRAM AND VELOCITY CURVE

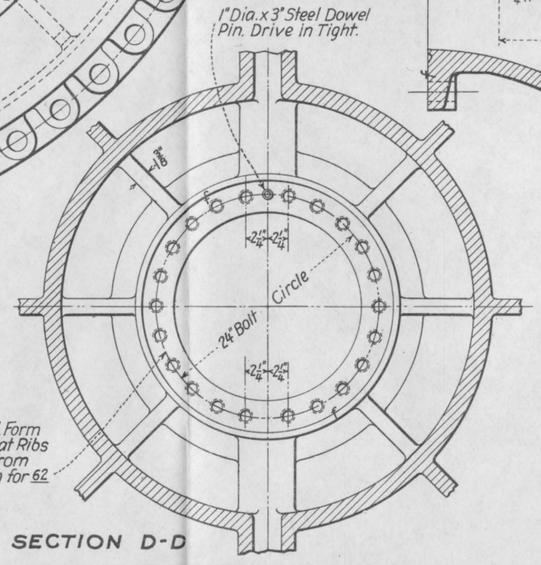
DRAWN: P.A.K.	SUBMITTED: C. M. Day		
TRACED: R. Mc C.	RECOMMENDED: J. L. Savage		
CHECKED: P.P.	APPROVED: R. J. Walker		
23453	DENVER COLO. JUNE 12, 1928 SHEET 3 OF 10		40-D-423

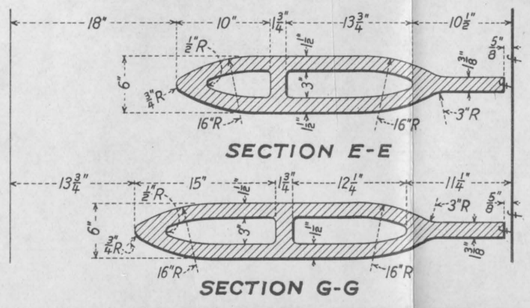


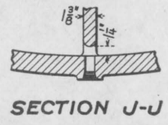
① LONG BODY
SEMISTEEL-ONE REQUIRED











DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE LONG BODY

DRAWN: P.A.K.	SUBMITTED: C.M. Day	
TRACED: C.B.G.	RECOMMENDED: J.H. Savage	
CHECKED: P.B.	APPROVED: R. F. Walter	
23454	DENVER, COLORADO, JUNE 1928 SHEET 4 OF 10	40-D-425

② NOZZLE
SEMISTEEL - ONE REQUIRED
Complete with Liner and Pipe Plugs

SECTION A-A

③ NEEDLE GUIDE
ROLLED BRONZE - EIGHT REQUIRED

Allow $\frac{1}{16}$" Metal on top face of NEEDLE GUIDE ③ for boring to exact diameter after assembly

Peen into Slots when assembled before boring

DETAIL "C"

④ SEAT RETAINER
CAST STEEL - ONE REQUIRED

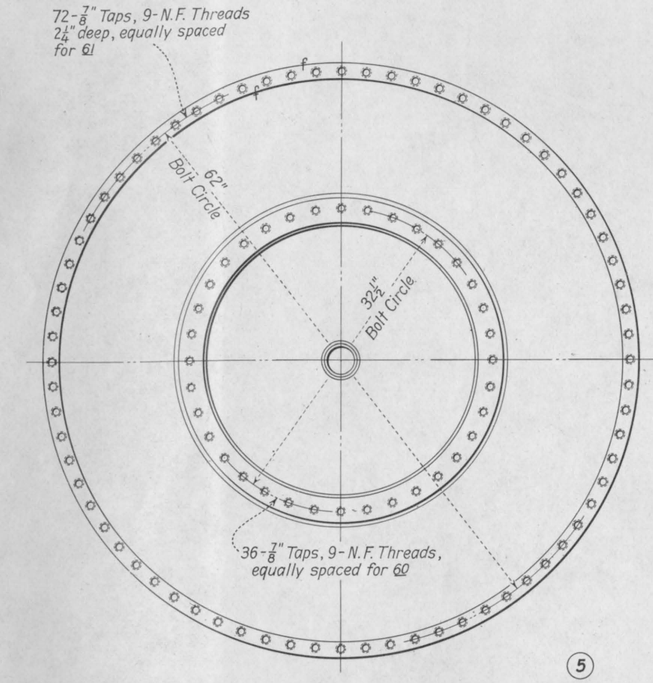
SEC. B-B

SEAT ASSEMBLY
VALVE CLOSED

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

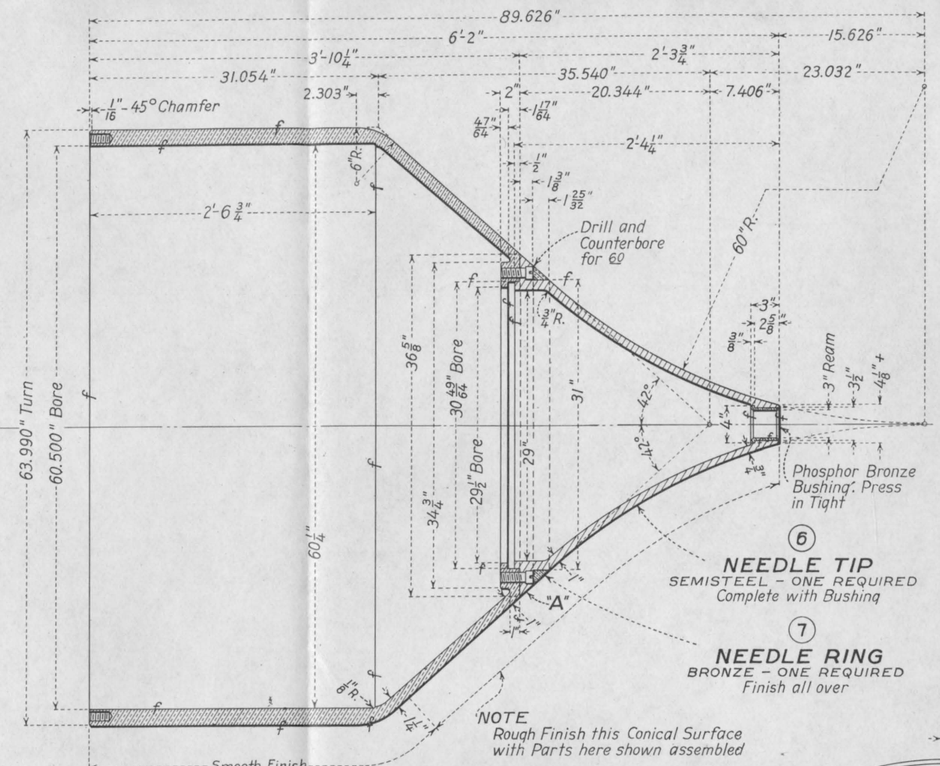
60" INTERNAL DIFFERENTIAL NEEDLE VALVE
NOZZLE AND SEAT RETAINER

DRAWN: P.A.K.	SUBMITTED: C.M. Day		
TRACED: I.C.N. M.	RECOMMENDED: J.L. Savage		
CHECKED: P.B.	APPROVED: R.F. Walter		
23455	DENVER COLO. JUNE 12, 1928 SHEET 5 OF 10	40-D-427	



(5) NEEDLE

CAST MANGANESE BRONZE – ONE REQUIRED



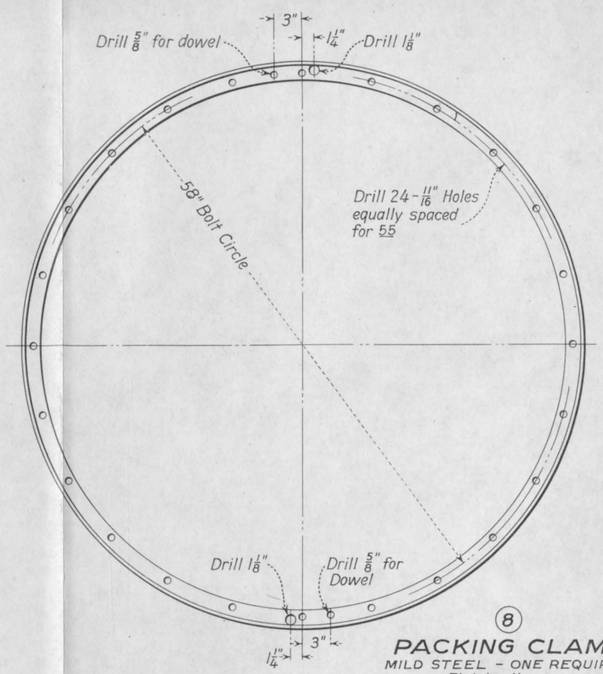
(6) NEEDLE TIP

SEMISTEEL – ONE REQUIRED
Complete with Bushing

(7) NEEDLE RING

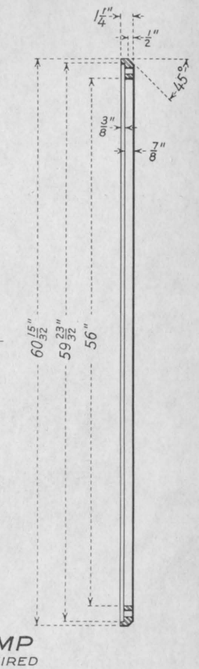
BRONZE – ONE REQUIRED
Finish all over

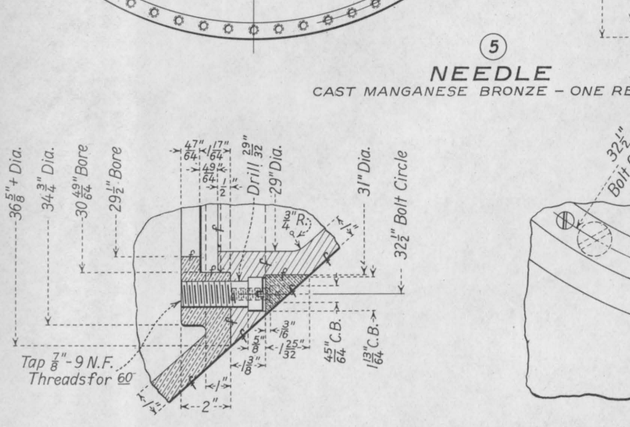
NOTE
Rough Finish this Conical Surface with Parts here shown assembled

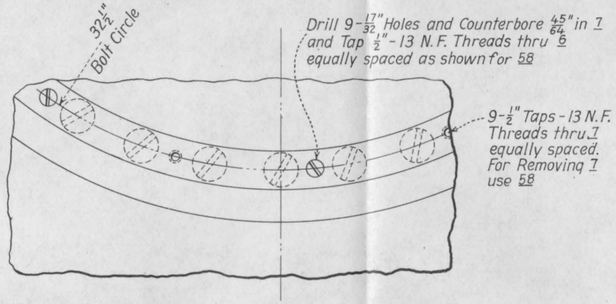


(8) PACKING CLAMP

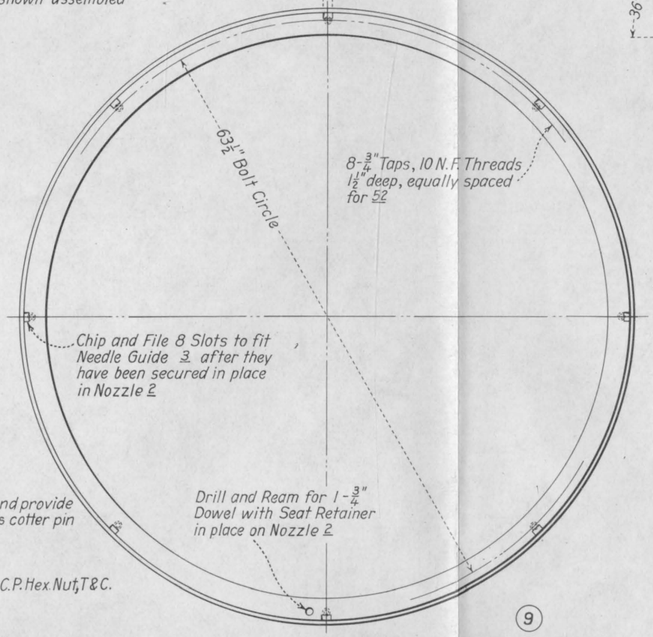
MILD STEEL – ONE REQUIRED
Finish all over





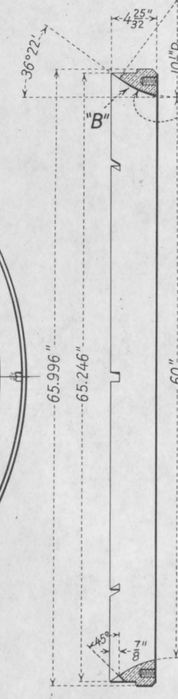


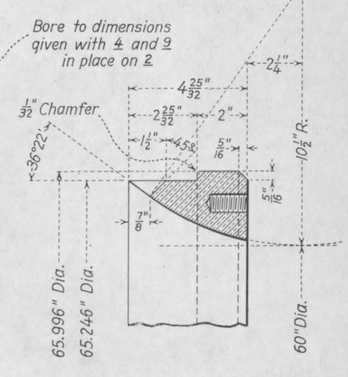
DETAIL VIEWS AT "A"



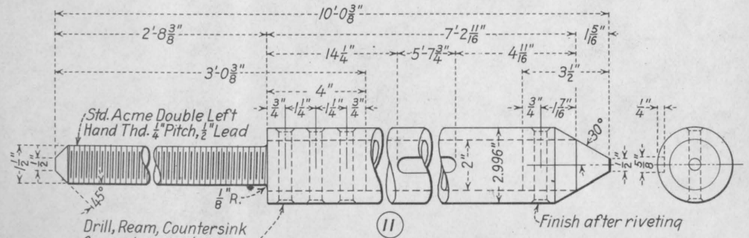
(9) NOZZLE SEAT

CAST MANGANESE BRONZE – ONE REQUIRED
Finish all over



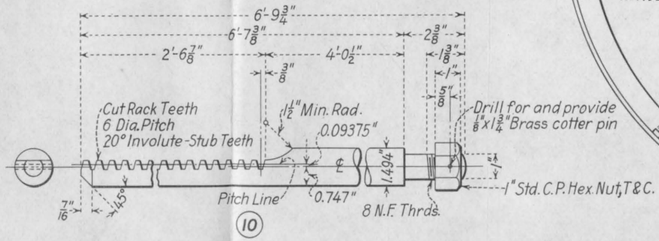


DETAIL "B"



(11) CONTROL SPEAR

BRASS – ONE REQUIRED
Finish all over



(10) INDICATOR RACK

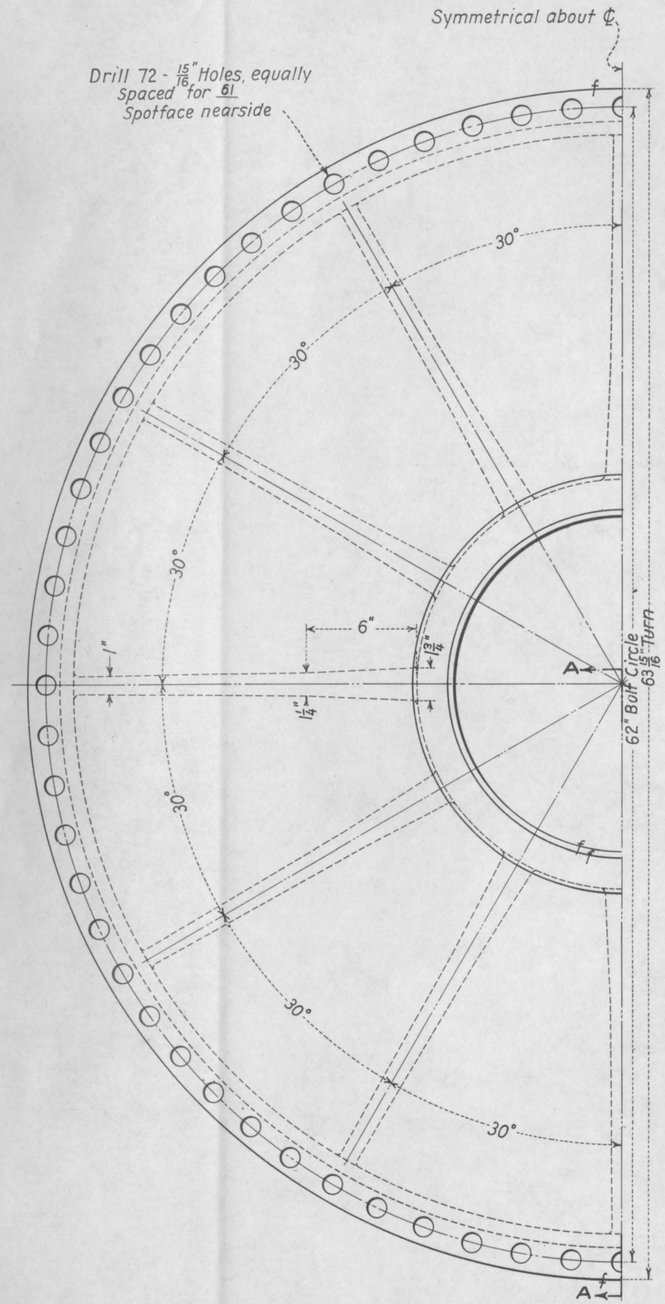
HIGH TENSILE BRONZE – ONE REQUIRED
Finish all over

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

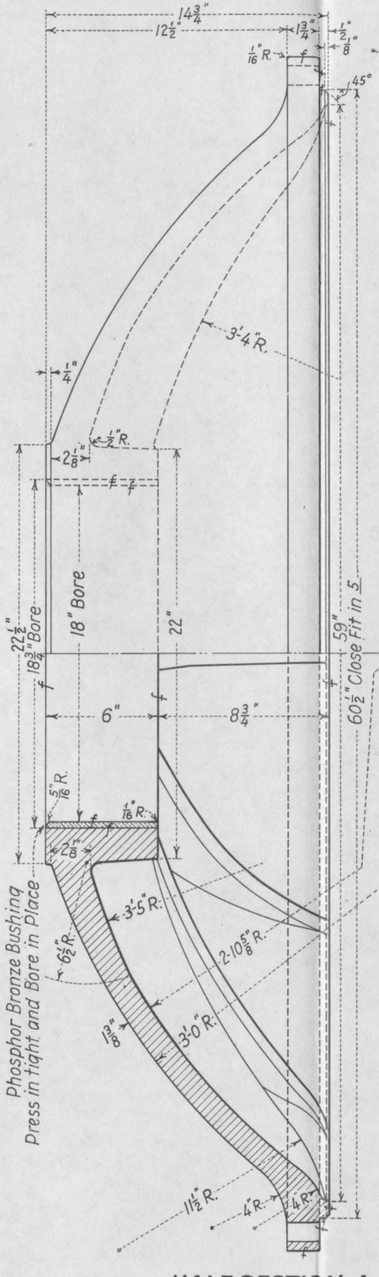
60" INTERNAL DIFFERENTIAL NEEDLE VALVE
NEEDLE-NOZZLE SEAT-PACKING CLAMP

DRAWN: P.A.K.	SUBMITTED:	C.M. Day	
TRACED: J.J.S.	RECOMMENDED:	J.L. Savage	
CHECKED: P.B.	APPROVED:	A.F. Walter	

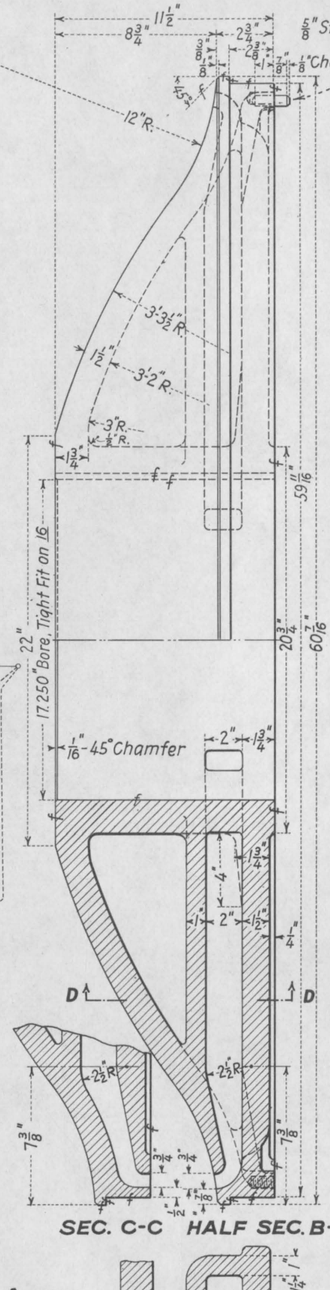
23456	DENVER COLO. JUNE 12, 1928 SHEET 6 OF 10	40-D-428



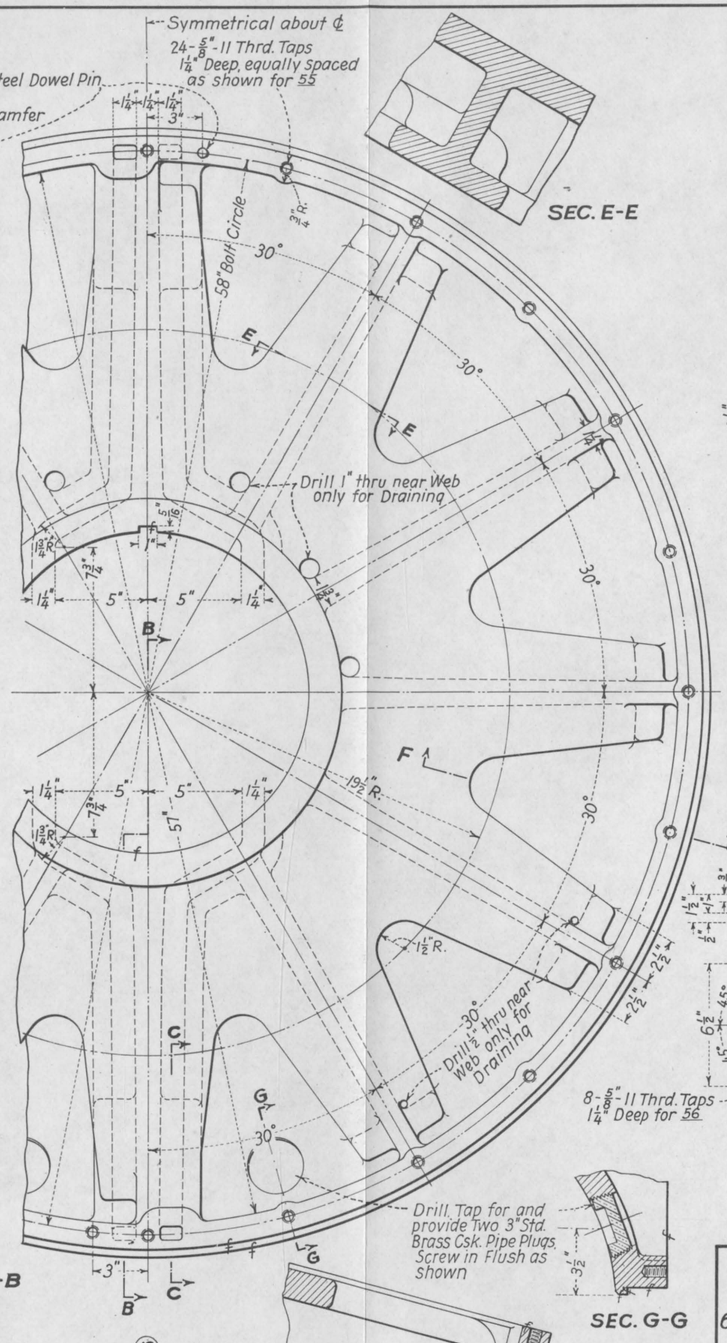
HALF REAR ELEVATION



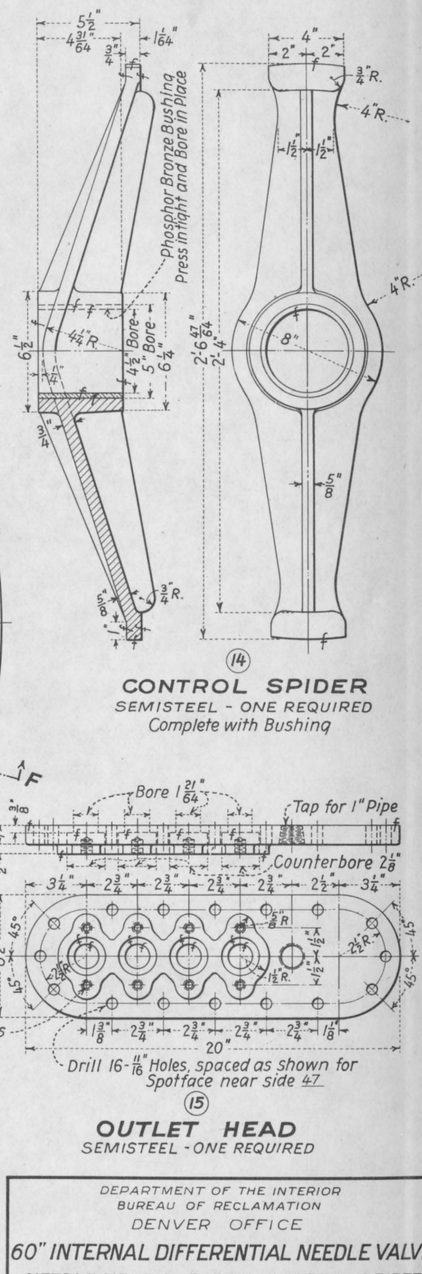
HALF SECTION A-A



SEC. C-C HALF SEC. B-B



SEC. E-E



(14)

CONTROL SPIDER

SEMISTEEL - ONE REQUIRED

Complete with Bushing

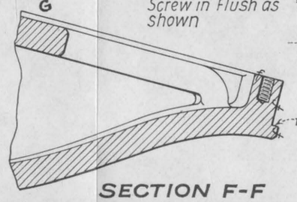
(15)

OUTLET HEAD

SEMISTEEL - ONE REQUIRED

SEC. G-G

SECTION D-D



SECTION F-F

(12)

NEEDLE HEAD

SEMISTEEL - ONE REQUIRED

Complete with Bushing

(13)

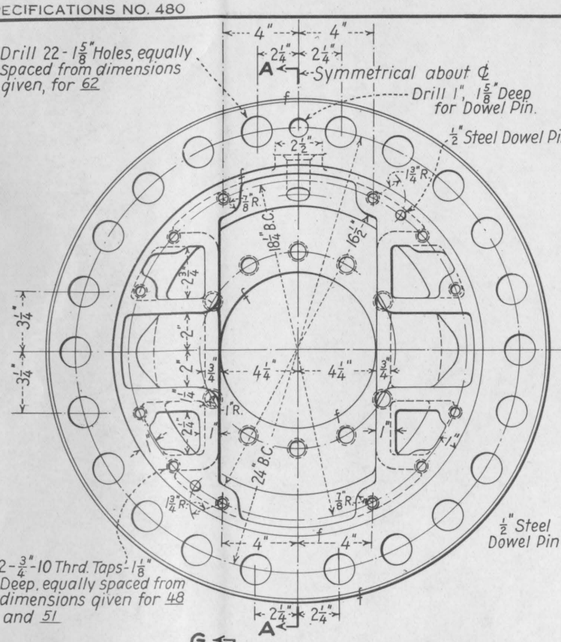
DIAPHRAGM

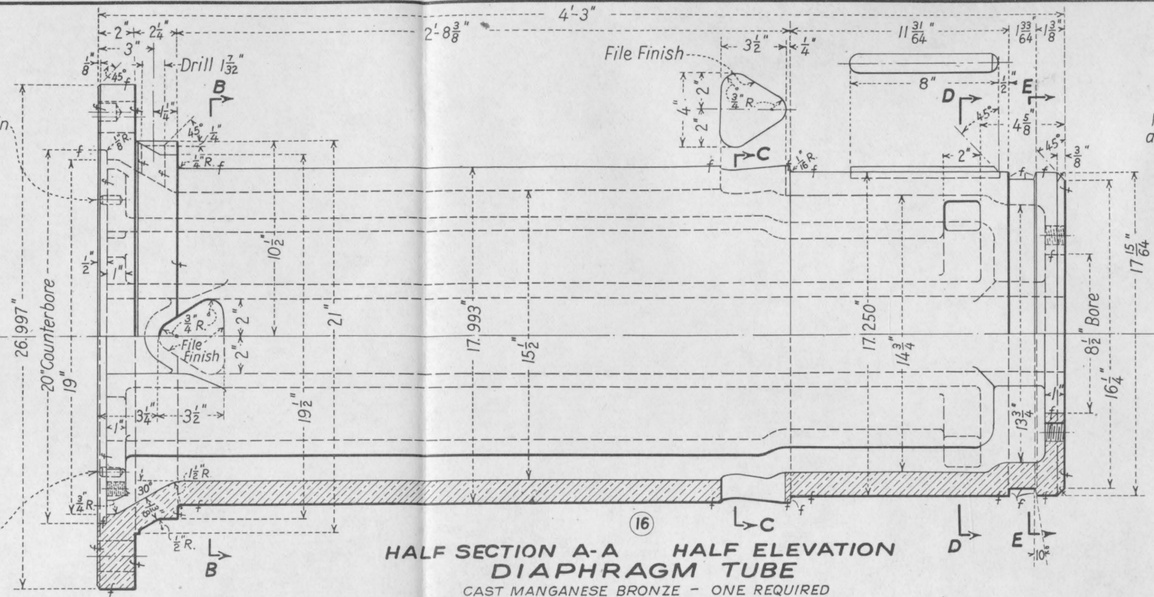
SEMISTEEL - ONE REQUIRED

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE
NEEDLE HEAD-DIAPHRAGM-CONTROL SPIDER

DRAWN: P.A.K.	SUBMITTED: C.M. Day		
TRACED: R.McC. C.A.M.	RECOMMENDED: J.L. Savage		
CHECKED: P.B.	APPROVED: R.F. Walter		
23457	DENVER COLO. JUNE 12, 1928 SHEET 7 OF 10.	40-D-429	

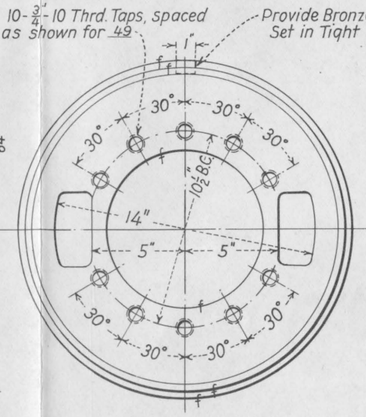


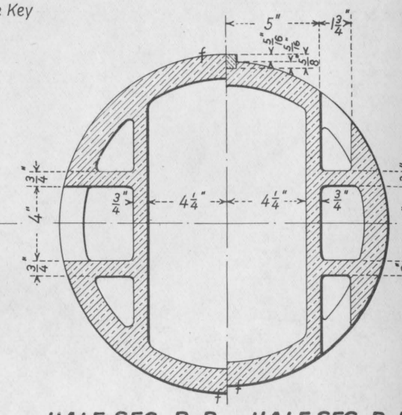


HALF SECTION A-A HALF ELEVATION

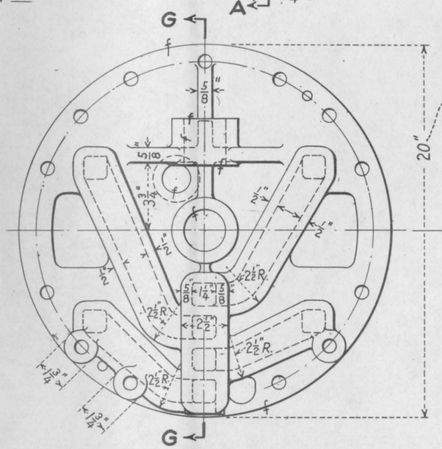
DIAPHRAGM TUBE

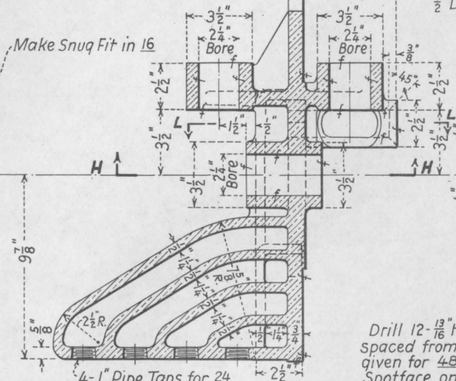
CAST MANGANESE BRONZE - ONE REQUIRED

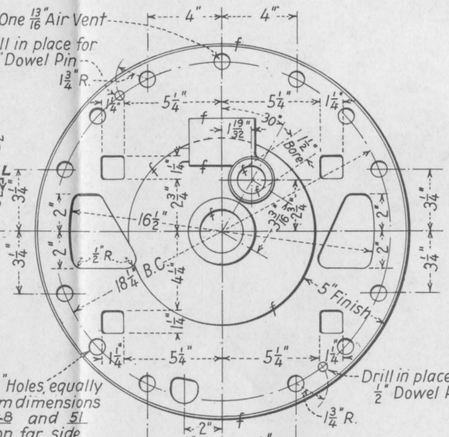


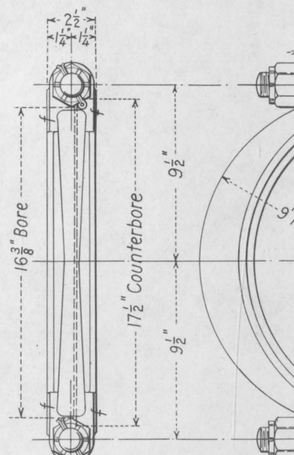


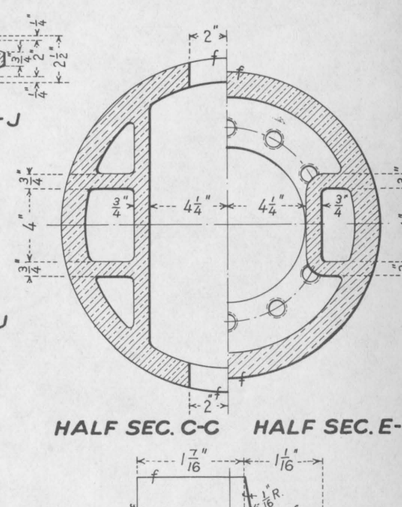
HALF SEC. B-B HALF SEC. D-D



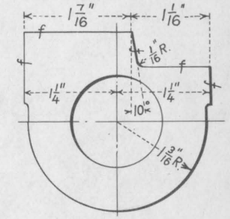




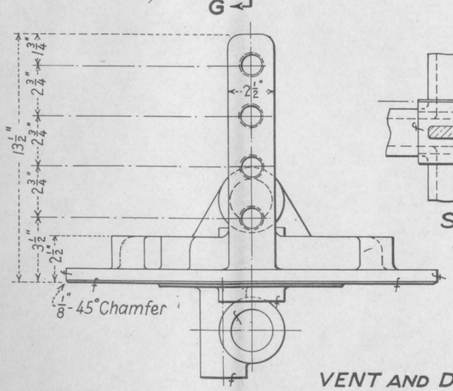




HALF SEC. C-C HALF SEC. E-E

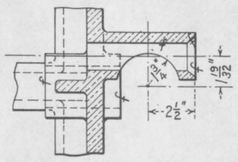


VIEW AT K-K

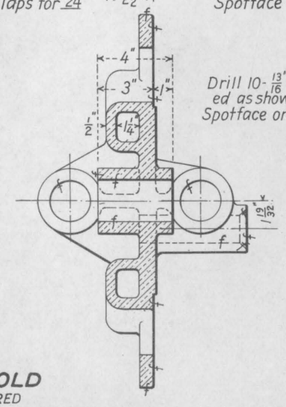


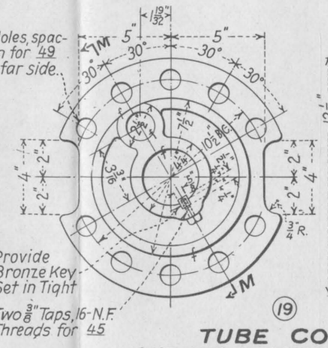
VENT AND DRAIN MANIFOLD

CAST MANGANESE BRONZE - ONE REQUIRED



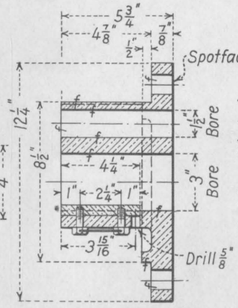
SEC. L-L





TUBE COVER

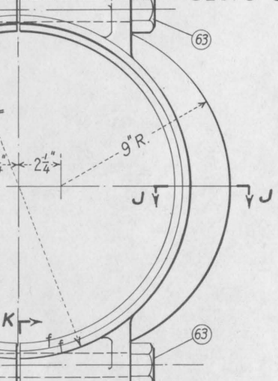
CAST MANGANESE BRONZE - ONE REQUIRED



SEC. M-M

CONTROL CROSSHEAD

CAST MANGANESE BRONZE - ONE REQUIRED



CROSSHEAD NUT

CAST MANGANESE BRONZE ONE REQUIRED Finish all over

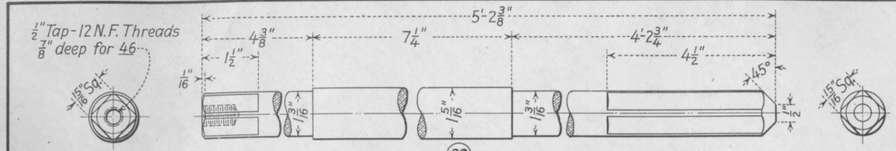
DIAPHRAGM CLAMP

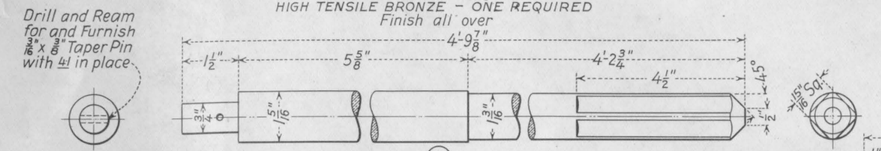
CAST MANGANESE BRONZE - ONE REQUIRED

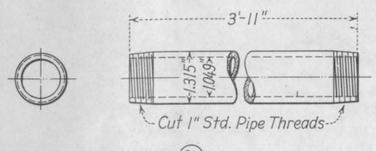
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

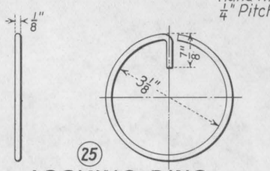
60" INTERNAL DIFFERENTIAL NEEDLE VALVE DIAPHRAGM TUBE AND CLAMP-MANIFOLD

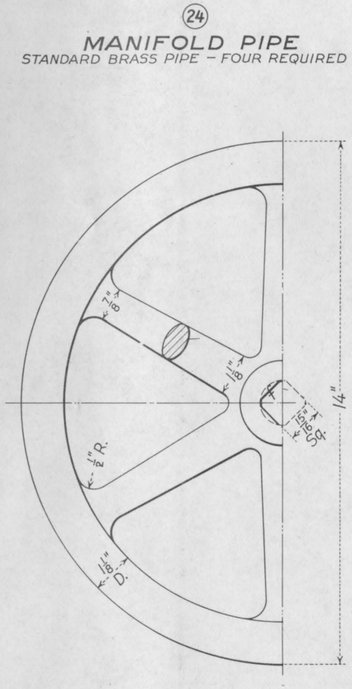
DRAWN: P.A.K.	SUBMITTED: C.M. Day		
TRACED: R.M.S.C.	RECOMMENDED: J.K. Galaz		
CHECKED: P.B.	APPROVED: R.F. Walter		
23458	DENVER, COLORADO. JUNE 1928 SHEET 8 OF 19		40-D-430

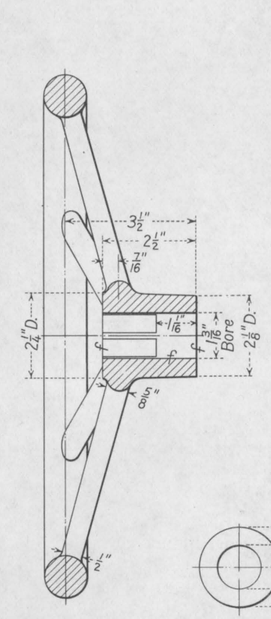


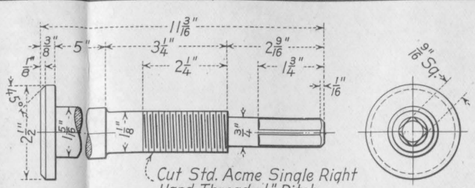


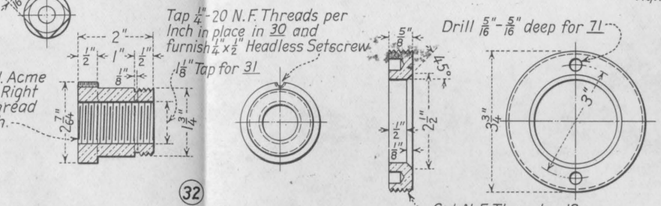


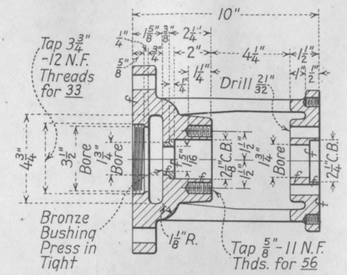


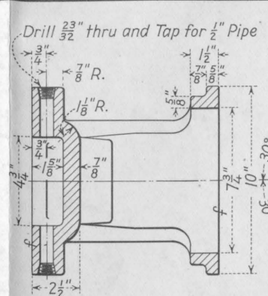


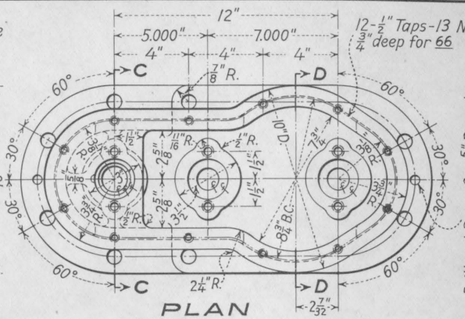


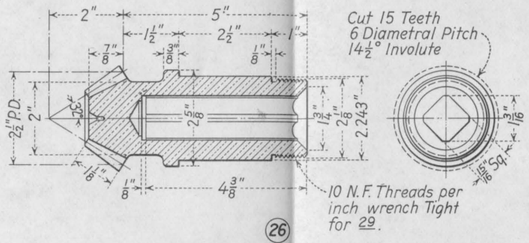


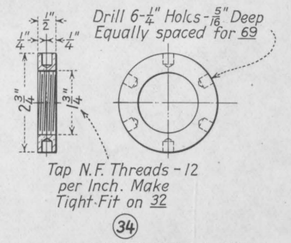


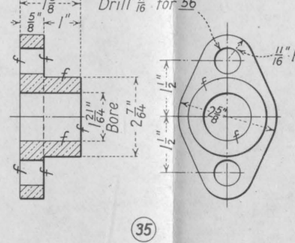


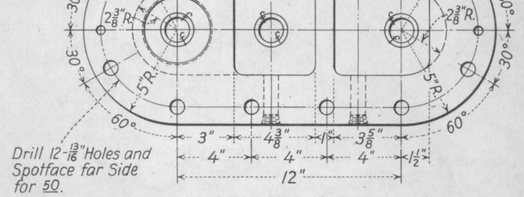


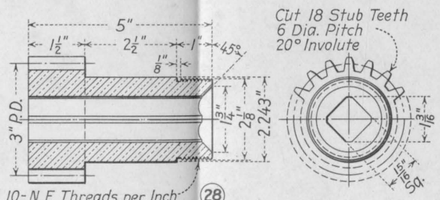


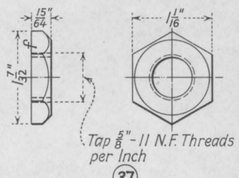


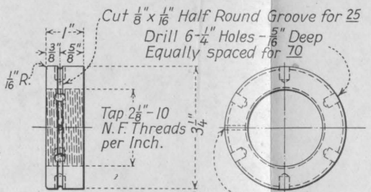


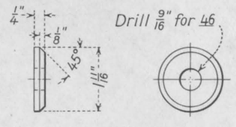


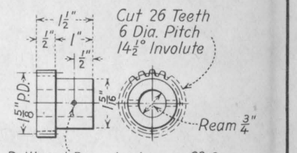


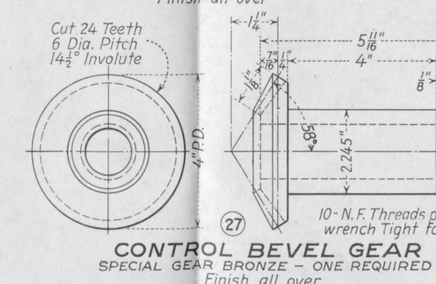


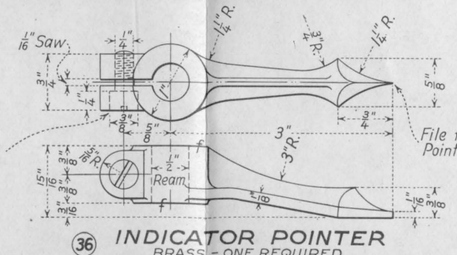










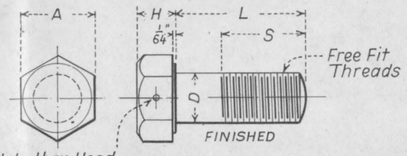


DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE
CONTROL HEAD-SHAFTS AND GEARS

DRAWN: P.A.K.-B.H.S. SUBMITTED: C.M. Day
TRACED: C.A.M.-J.J.S. RECOMMENDED: [illegible]
CHECKED: P.B. APPROVED: R. F. Walter

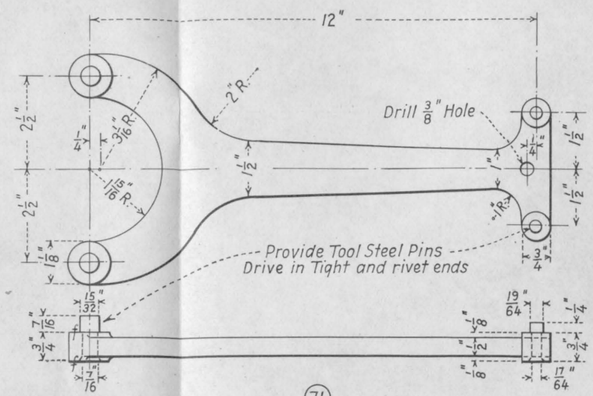
23459	DENVER, COLORADO. JUNE 1928 SHEET 9 OF 10	40-D-431



TAP BOLTS

PART NUMBER	NUMBER REQUIRED	DIMENSIONS IN INCHES D	L	S	A	H	N	W	MATERIAL	USED WITH PARTS
45	3	3/8	1	5/8	5/8	9/32	16	3/32	Bolt Steel - Class "A"	19 and 20
46	1	1/2	1	7/8	13/16	3/8	13	—	" " " "	22 and 40
47	16	5/8	2 1/8	1 3/8	15/16	15/32	11	—	" " " "	1 and 15
48	9	3/4	1 3/4	1 1/4	1 1/8	9/16	10	1/8	" " " "	16 and 18
49	10	3/4	2	1 3/8	1 1/8	9/16	10	1/8	" " " "	16 and 19
50	12	3/4	2 1/2	1 1/2	1 1/8	9/16	10	—	" " " "	1 and 30
51	3	3/4	3 1/2	1 1/4	1 1/8	9/16	10	1/8	" " " "	16 and 18
52	8	3/4	3 3/4	1 3/8	1 1/8	9/16	10	—	" " " "	4 and 9
53	8	1	5 1/2	5 1/4	1 1/2	3/4	8	—	" " " "	4
* 54	48	2	5	3 3/4	3	1 1/2	4 1/2	—	" " " "	1

* Not required for Long Body Type Valves

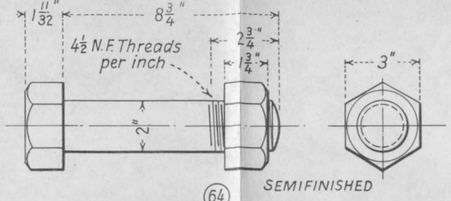


(71)

CROSSHEAD NUT WRENCH

CAST STEEL - ONE REQUIRED

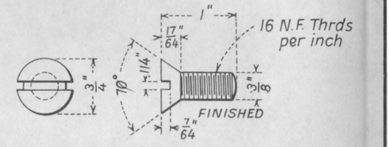
Used with Parts 21 and 33
See Sheet 1 for Number Required



(64)

BOLT WITH NUT

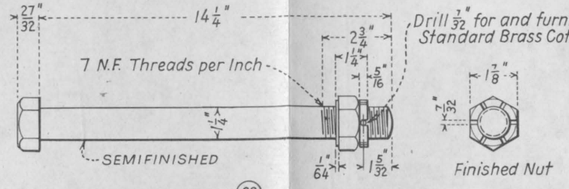
BOLT STEEL - CLASS A
SIXTY REQUIRED
Used with Parts 1 and 2



(65)

FLATHEAD CAPSCREW

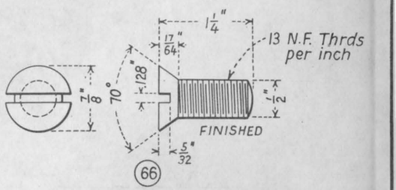
BOLT STEEL - CLASS C
ONE REQUIRED
Used with Part 31



(63)

BOLT WITH CASTELLATED NUT

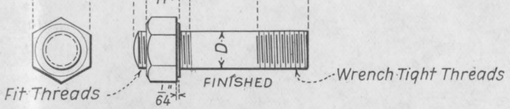
BOLT STEEL - CLASS A
TWO REQUIRED
Used with Part 17



(66)

FLATHEAD CAPSCREW

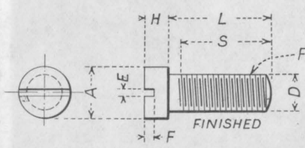
BOLT STEEL - CLASS C
TWELVE REQUIRED
Used with Part 30 and Control Cover



N = Number of National Form Threads per Inch
All Nuts except as otherwise Specified to be Cold Punched Chamfered and Trimmed, Commercial Grade of Steel

STUDS WITH NUTS

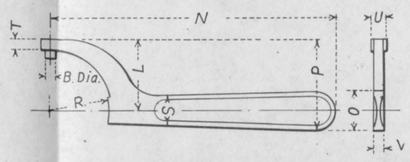
PART NUMBER	NUMBER REQUIRED	DIMENSIONS IN INCHES D	L	S	T	A	H	N	MATERIAL	USED WITH PARTS
55	24	5/8	3	1 1/8	1 1/4	15/16	35/64	11	Bolt Steel - Class A	8 and 13
56	14	5/8	3 1/2	1 1/8	1 3/8	15/16	35/64	11	" " " A, Bronze Nut	15, 30 and 35
57	56	1 1/2	7	2 3/4	2 1/4	2 1/4	1 5/16	6	" " " A	2 and 4



N = Number of National Form Threads per Inch

FILLISTER HEAD CAP SCREWS

PART NUMBER	NUMBER REQUIRED	DIMENSIONS IN INCHES D	L	S	A	H	E	F	N	MATERIAL	USED WITH PARTS
58	9	1/2	1 1/2	1 3/8	7/16	5/16	.112	1/8	13	Bolt Steel - Class "A"	6 and 7
59	72	9/16	1 1/4	1 1/8	3/4	3/8	.133	9/64	12	Rolled Bronze	2 and 3
60	36	7/8	2 3/4	2 1/4	1 3/16	9/16	.133	7/32	9	Bolt Steel - Class "A"	5 and 6



SPANNER WRENCHES

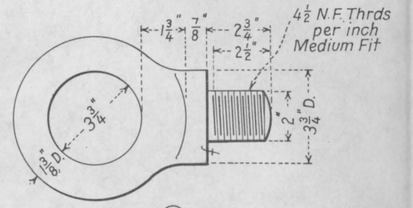
PART NUMBER	NUMBER REQUIRED	DIMENSIONS IN INCHES R	B	N	L	P	O	S	T	U	V	MATERIAL	USED WITH PARTS
69	*	1 3/8	17/64	6 3/4	1 1/2	2 3/8	7/8	5/8	1/4	11/32	1/4	Steel	34
70	*	1 5/8	9/32	7 3/4	1 1/8	1 15/16	1	3/4	9/32	3/8	9/32	"	29

* See Sheet 1 for Number Required

(68)

RING PACKING

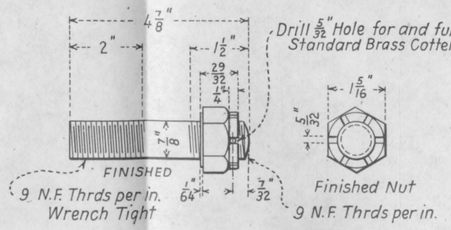
GARLOCK NO. 99 OR EQUAL
TWENTY RINGS REQUIRED



(67)

EYE BOLT

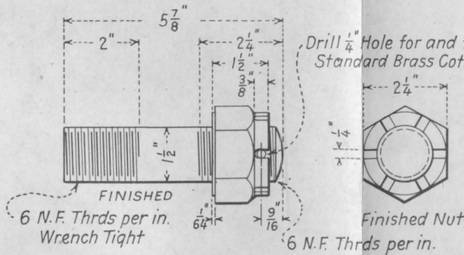
STANDARD FORGED STEEL
Used with Part 2
See Sheet 1 for Number Required



(61)

STUD WITH CASTELLATED NUT

BOLT STEEL - CLASS A
SEVENTY TWO REQUIRED
Used with Parts 5 and 12



(62)

STUD WITH CASTELLATED NUT

BOLT STEEL - CLASS A
TWENTY TWO REQUIRED
Used with Parts 1 and 16

NOTES

Threads designated "N. F." are to be in accordance with U. S. Government Master Specification for Bolts, Nuts and Machine Screws, Federal Specifications Board Specification No. 548.

Make all Threads Free Fit (class 2) unless otherwise specified.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

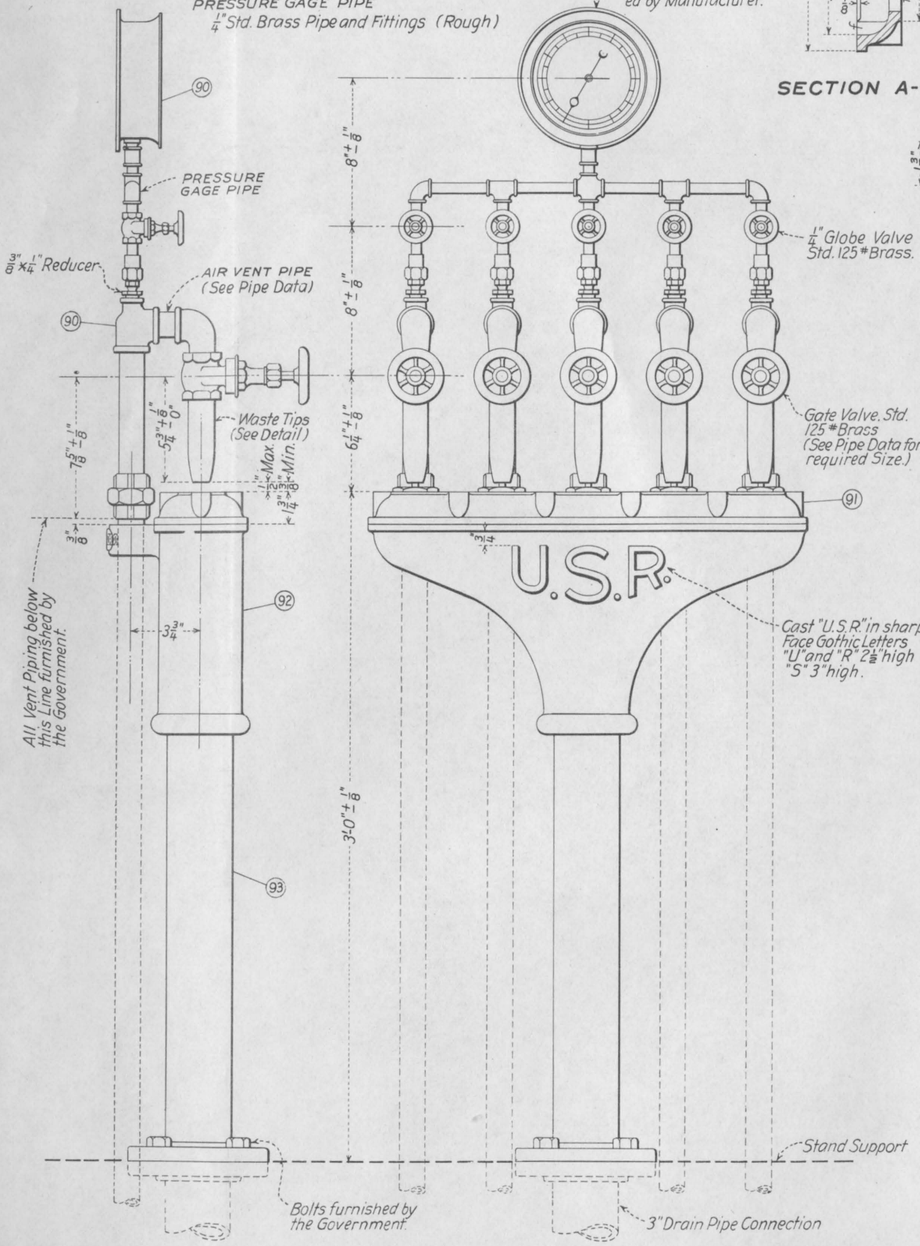
60" INTERNAL DIFFERENTIAL NEEDLE VALVE BOLTS-STUDS-SCREWS-WRENCHES

DRAWN: B.H.S.	SUBMITTED:	C. M. Day	
TRACED: R.M.C.	RECOMMENDED:	G. E. Lafaye	
CHECKED: P.B.	APPROVED:	R. F. Walter	

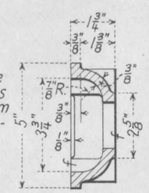
23460 | DENVER COLO. JUNE 12, 1928 SHEET 10 OF 10 | 40-D-432

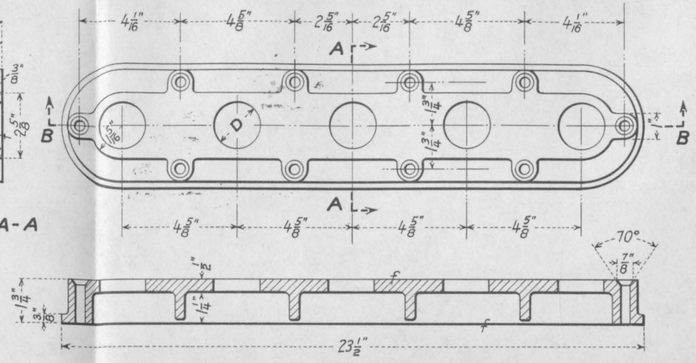
(90) AIR VENT AND PRESSURE GAGE PIPING

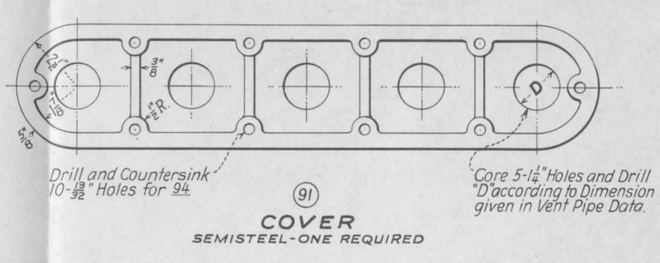
AIR VENT PIPE
Std. Brass Pipe and Fittings (Rough)
PRESSURE GAGE PIPE
1/4" Std. Brass Pipe and Fittings (Rough)



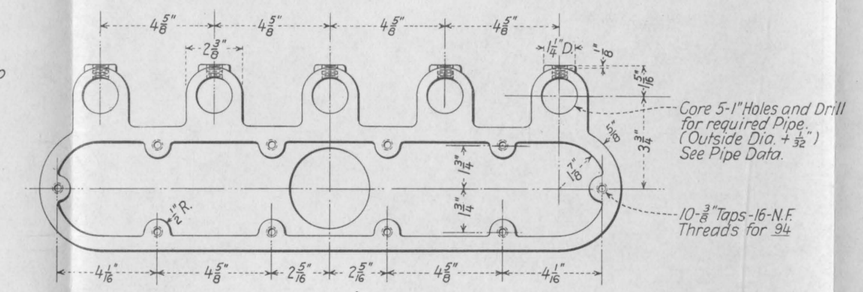
ASSEMBLY

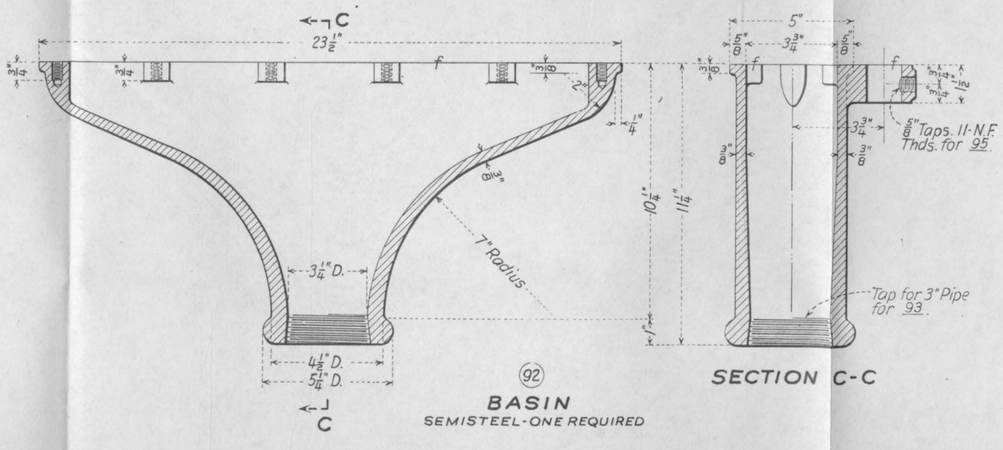






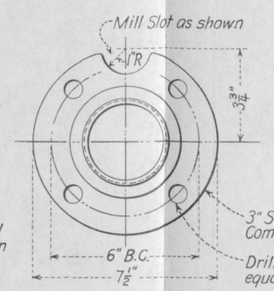
(91)
COVER
SEMISTEEL-ONE REQUIRED

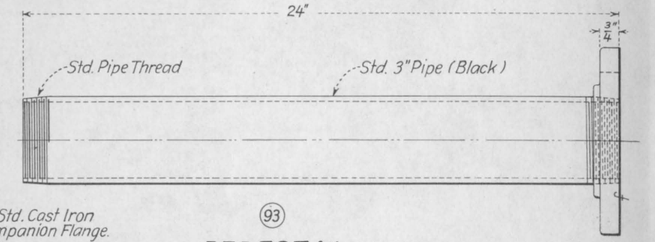




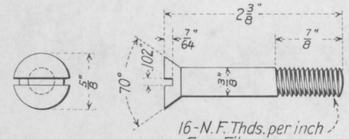
(92)
BASIN
SEMISTEEL-ONE REQUIRED

SECTION C-C

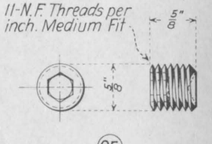




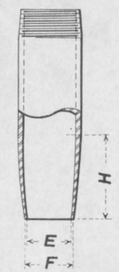
(93)
PEDESTAL
ONE REQUIRED



(94)
FLAT HEAD MACHINE SCREW
BOLT STEEL-CLASS "C"-TEN REQUIRED
Finished



(95)
HEADLESS SET SCREW
STEEL-FIVE REQUIRED
Finished and Case-hardened



WASTE TIP

LIST OF PARTS-ONE VENT STAND

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED
90	Air Vent and Pressure Gage Pipe	See Detail	1-Unit
91	Cover	Semisteel	1
92	Basin	Semisteel	1
93	Pedestal	Std. Black Pipe, C.I. Flange	1
94	⅜"x2⅜" F.H. Machine Screw	Bolt Steel, Class "C"	10
95	⅝"x⅝" Headless Set Screw	Steel	5

VENT PIPE DATA

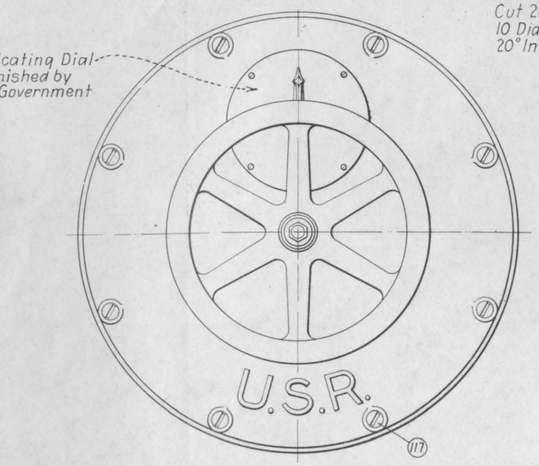
VALVE SIZE	REQUIRED PIPE SIZE	"D"	WASTE TIP DIMENSIONS		
			E	F	H
24"	¾"	1⅜"	1 1/16"	¾"	1¾"
30"	¾"	1⅜"	1 1/16"	¾"	1¾"
36"	¾"	1⅜"	1 1/16"	¾"	1¾"
42"	¾"	1⅜"	1 1/16"	¾"	1¾"
48"	1"	1⅜"	1⅛"	15/16"	2"
54"	1"	1⅝"	1⅛"	15/16"	2"
60"	1"	1⅝"	1⅛"	15/16"	2"
66"	1¼"	1⅞"	1 3/16"	1¼"	2¼"
72"	1¼"	1⅞"	1 3/16"	1¼"	2¼"

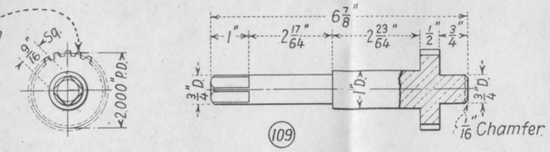
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

INTERNAL DIFFERENTIAL NEEDLE VALVE VENT STAND ASSEMBLY-LIST OF PARTS-DETAILS

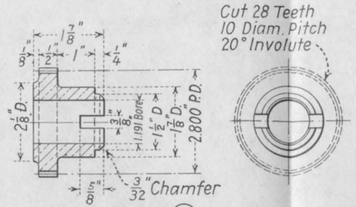
DRAWN: B.H.S. SUBMITTED: C.M. Day
TRACED: C.B.G. RECOMMENDED: J.K. Savage
CHECKED: P.B. APPROVED: R. F. Walter

23461 | DENVER, COLORADO, JUNE 1928 | 40-D-433

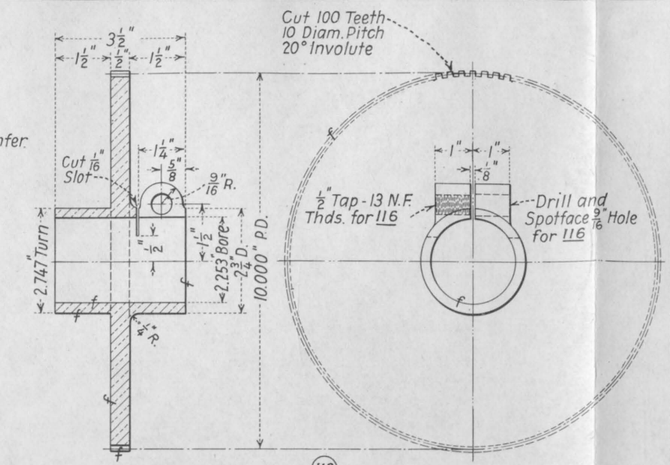




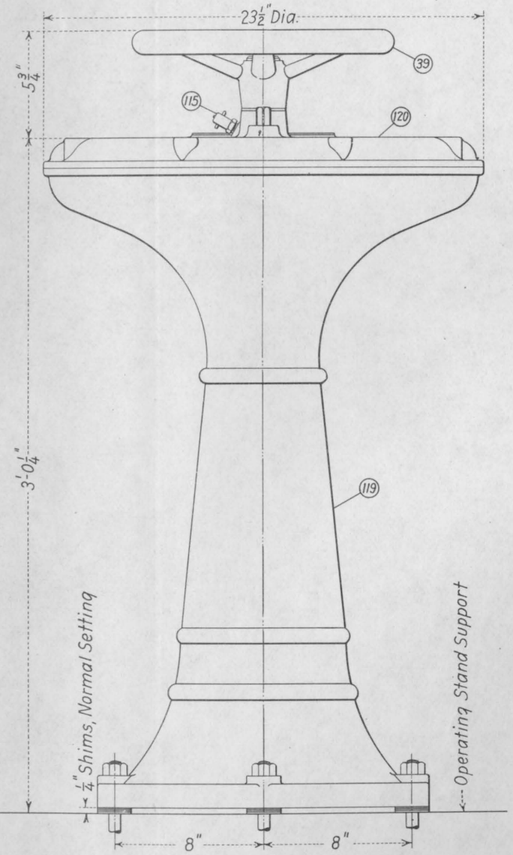
SPEED CONTROL PINION
ROLLED TOBIN BRONZE - ONE REQUIRED
Finish all over



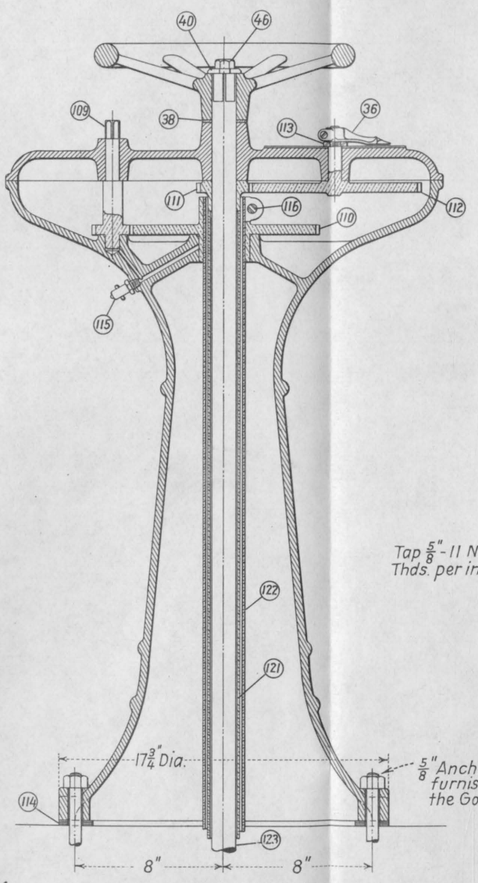
DRIVING PINION
BRASS - ONE REQUIRED
Finish all over

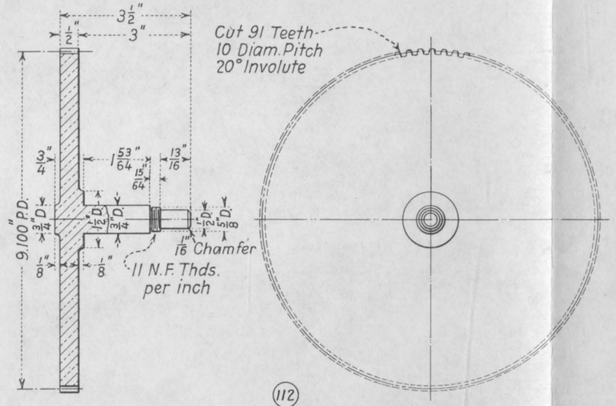


SPEED CONTROL GEAR
BRONZE - ONE REQUIRED

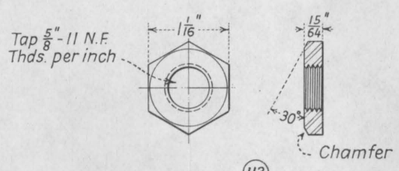


ASSEMBLY

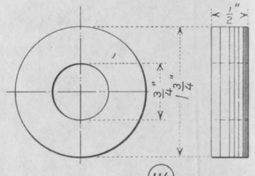




SECOND INDICATOR GEAR
BRASS - ONE REQUIRED
Finish all over

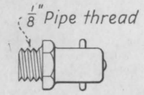


LOCK NUT
STEEL - ONE REQUIRED
Finish all over



SHIM
SHEET STEEL
FOUR REQUIRED

SHIM
2 Sheets @ .125" thick
3 Sheets @ .0625" thick
6 Sheets @ .010" thick

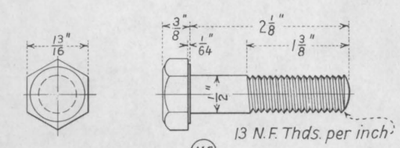


ALEMITE FITTING
PART NO. A-336 - THREE REQUIRED

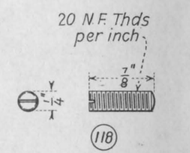
LIST OF PARTS - ONE CONTROL STAND

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED	DRAWING NUMBER
100	Control Cover	Semisteel	1	Sheet 2 of 10
101	Indicator Gear	Special Gear Bronze	1	" "
102	Driven Pinion	Special Gear Bronze	1	" "
103	Collar	Brass	1	" "
104	Control Coupling	Steel	1	" "
105	Indicator Coupling	Brass	1	" "
106	First Speed Control Valve Gear	Brass	1	" "
107	Second Speed Control Valve Gear	Brass	1	" "
108	Coupling Head	Brass	1	" "
109	Speed Control Pinion	Rolled Tobin Bronze	1	40-D-434
110	Speed Control Gear	Bronze	1	" "
111	Driving Pinion	Brass	1	" "
112	Second Indicator Gear	Brass	1	" "
113	Lock Nut	Steel	1	" "
114	Shim	Sheet Steel	4	" "
115	Alemite Fitting No. A-336	Standard Alemite	3	" "
116	1/2" x 2 1/8" Tap Bolt	Bolt Steel - Class C	2	" "
117	1/2" x 2 5/8" Flat Head Cap Screw	Bolt Steel - Class C	8	" "
118	1/4" x 7/8" Headless Set Screw	Steel	1	" "
119	Pedestal	Semisteel	1	40-D-435
120	Pedestal Cover	Semisteel	1	" "
121	Indicator Extension Stem	Seamless Brass Tubing	1	" "
122	Pitot Extension Stem	Seamless Brass Tubing	1	" "
123	Control Extension Stem	Cold Finished Steel Shafting	1	" "
124	Standard Hose - A - 1039	Standard Alemite	1	No Detail
125	Alemite Compressor - C - 700	Standard Alemite	1	No Detail

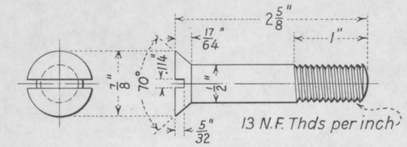
Note:- Furnish one each of Parts 124 and 125 for each Item of Contract, regardless of the Number of Valves Specified



TAP BOLT
BOLT STEEL - CLASS C - TWO REQUIRED
Finished



HEADLESS SET SCREW
STEEL - ONE REQUIRED
Finished



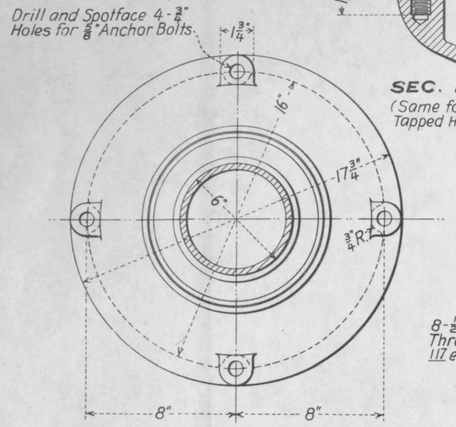
FLATHEAD CAPSCREW
BOLT STEEL - CLASS C - EIGHT REQUIRED
Finished

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

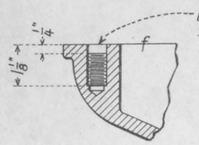
INTERNAL DIFFERENTIAL NEEDLE VALVE CONTROL STAND
ASSEMBLY - LIST OF PARTS - GEARS

DRAWN: B.H.S. SUBMITTED: C. M. Day
TRACED: C.A.M. R.M.C. RECOMMENDED: J. L. Savage
CHECKED: P.B. APPROVED: R. F. Walter

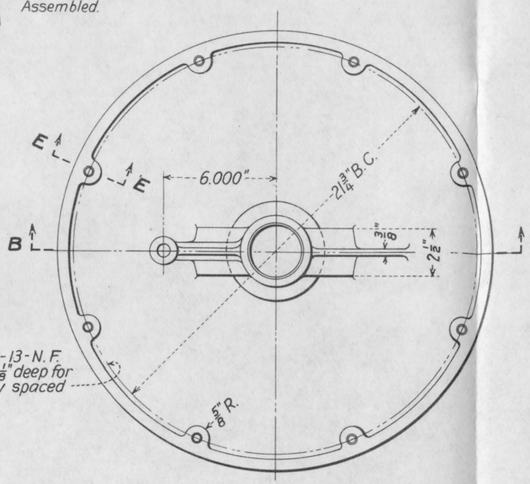
23462 | DENVER, COLORADO, JUNE 1928 SHEET 1 OF 2 | 40-D-434



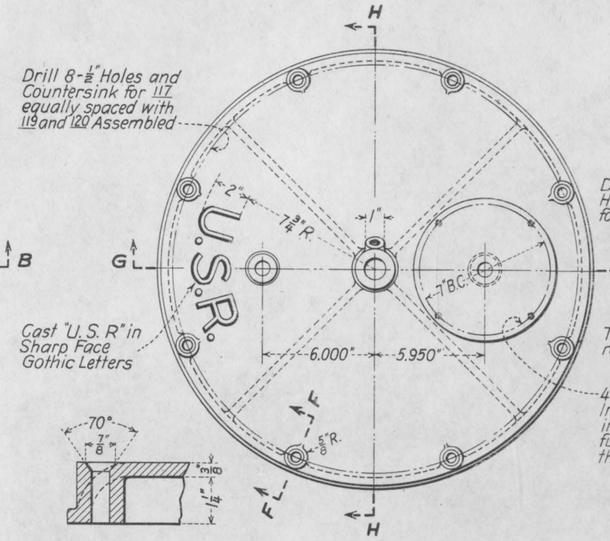
SECTION A-A



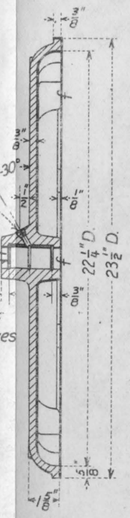
SEC. E-E
(Same for all Tapped Holes)



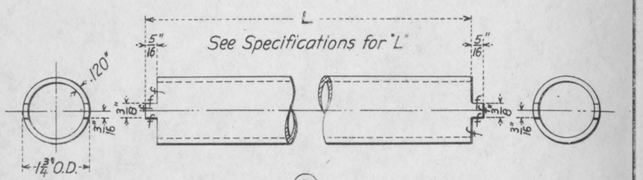
PLAN



SECTION F-F

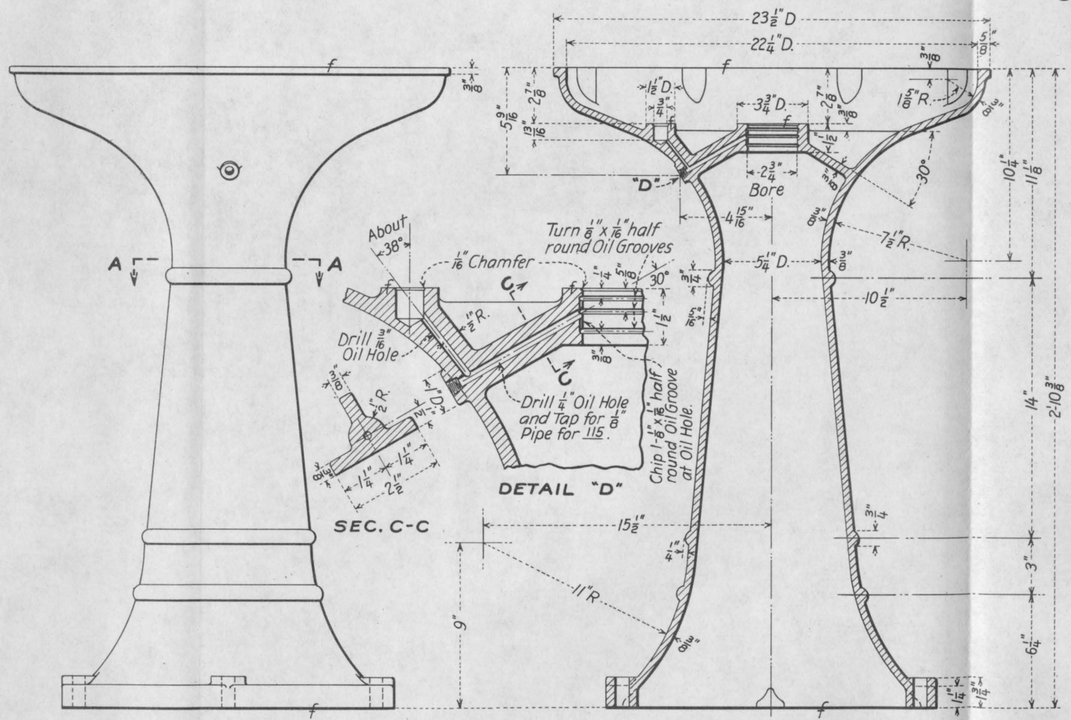


SECTION H-H



(121)

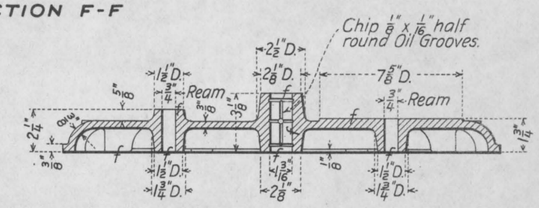
INDICATOR EXTENSION STEM
SEAMLESS BRASS TUBING - ONE REQUIRED



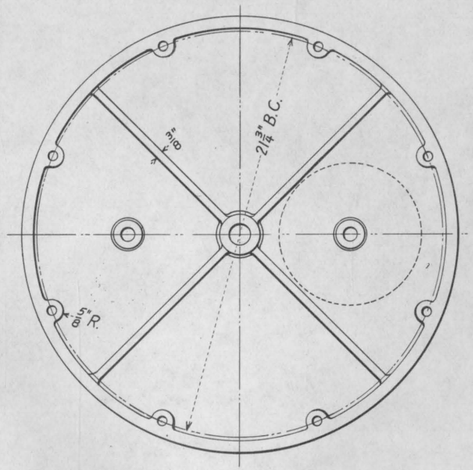
SECTION B-B

(119)

PEDESTAL
SEMISTEEL - ONE REQUIRED

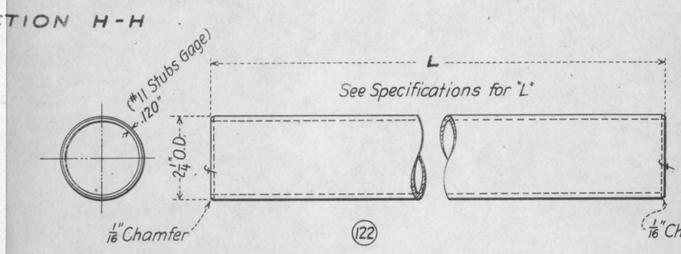


SECTION G-G



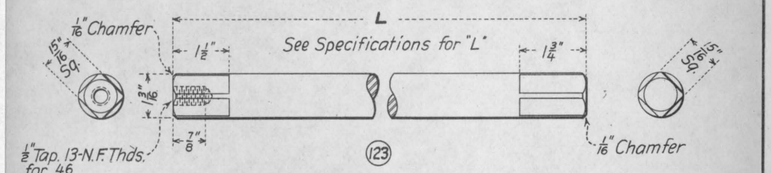
(120)

PEDESTAL COVER
SEMISTEEL - ONE REQUIRED



(122)

PITOT EXTENSION STEM
SEAMLESS BRASS TUBING - ONE REQUIRED



(123)

CONTROL EXTENSION STEM
COLD FINISHED STEEL SHAFTING - ONE REQUIRED

TABLE FOR "L"

SIZE OF VALVE	LENGTH OF EXTENSION STEMS (121) FOR INDICATOR	(122) FOR PITOT	(123) FOR CONTROL
24"			
30"			
36"			
42"			
48"			
54"			
60"	H-2'-10 3/4"	H-2'-10 3/8"	H-2'-0 1/16"
66"			
72"			

Note: H = the height of the operating floor above the center line of valve.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

INTERNAL DIFFERENTIAL NEEDLE VALVE CONTROL STAND PEDESTAL-COVER-EXTENSION STEMS

DRAWN: B.H.S. SUBMITTED: C.M. Day
TRACED: C.B.G. RECOMMENDED: J.L. Savage
CHECKED: P.B. APPROVED: R.J. Walker

23463 | DENVER, COLORADO, JUNE 1928 SHEET 2 OF 2 | 40-D-435

LIST OF PARTS - ONE VALVE

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED	DRAWING NUMBER
1	Short Body	Semisteel	1	40-D-426
2	Nozzle	Semisteel and Bronze	1	40-D-427
3	Needle Guide	Rolled Bronze	8	" "
4	Seat Retainer	Cast Steel	1	" "
5	Needle	Cast Manganese Bronze	1	40-D-428
6	Needle Tip	Semisteel and Bronze	1	" "
7	Needle Ring	Bronze	1	" "
8	Packing Clamp	Mild Steel	1	" "
9	Nozzle Seat	Cast Manganese Bronze	1	" "
10	Indicator Rack	High Tensile Bronze	1	" "
11	Control Spear	Brass	1	" "
12	Needle Head	Semisteel and Bronze	1	40-D-429
13	Diaphragm	Semisteel	1	" "
14	Control Spider	Semisteel and Bronze	1	" "
15	Outlet Head	Semisteel	1	" "
16	Diaphragm Tube	Cast Manganese Bronze	1	40-D-430
17	Diaphragm Clamp	Cast Manganese Bronze	1	" "
18	Vent and Drain Manifold	Cast Manganese Bronze	1	" "
19	Tube Cover	Cast Manganese Bronze	1	" "
20	Control Crosshead	Cast Manganese Bronze	1	" "
21	Crosshead Nut	Cast Manganese Bronze	1	" "
22	Control Shaft	High Tensile Bronze	1	40-D-431
23	Indicator Shaft	High Tensile Bronze	1	" "
24	Manifold Pipe	Standard Brass Pipe	4	" "
25	Locking Ring	Spring Brass Wire	3	" "
26	Control Bevel Pinion	Special Gear Bronze	1	" "
27	Control Bevel Gear	Special Gear Bronze	1	" "
28	Rack Pinion	Special Gear Bronze	1	" "
29	Gear Nut	Mild Steel	3	" "
30	Control Head	Semisteel	1	" "
31	Speed Control Valve	Bronze	1	" "
32	Speed Control Valve Nut	Bronze	1	" "
33	Speed Control Valve Seat	Bronze	1	" "
34	Valve Nut Collar	Bronze	1	" "
35	Gland	Bronze	7	" "
36	Indicator Pointer	Brass	1	" "

LIST OF PARTS CONTINUED

PART NUMBER	DESCRIPTION	MATERIAL	NUMBER REQUIRED	DRAWING NUMBER
37	Lock Nut	Steel	1	40-D-431
38	Thrust Washer	Bronze	1	" "
39	Control Wheel	Semisteel	1	" "
40	Control Wheel Washer	Mild Steel	1	" "
41	Indicator Pinion	Special Gear Bronze	1	" "
45	3/8"x1" Tap Bolt	Bolt Steel - Class "A"	3	40-D-432
46	1/2"x1" Tap Bolt	Bolt Steel - Class "A"	1	" "
47	5/8"x2 1/8" Tap Bolt	Bolt Steel - Class "A"	16	" "
48	3/4"x1 3/4" Tap Bolt	Bolt Steel - Class "A"	9	" "
49	3/4"x2" Tap Bolt	Bolt Steel - Class "A"	10	" "
50	3/4"x2 1/2" Tap Bolt	Bolt Steel - Class "A"	12	" "
51	3/4"x3 1/2" Tap Bolt	Bolt Steel - Class "A"	3	" "
52	3/4"x3 3/4" Tap Bolt	Bolt Steel - Class "A"	8	" "
53	1"x5 1/2" Tap Bolt	Bolt Steel - Class "A"	8	" "
54	2"x5" Tap Bolt	Bolt Steel - Class "A"	48	" "
55	5/8"x3" Stud with Nut	Bolt Steel - Class "A"	24	" "
56	5/8"x3 1/2" Stud with Nut	Bolt Steel - Cl. "A" - Bronze Nut	14	" "
57	1 1/2"x7" Stud with Nut	Bolt Steel - Class "A"	56	" "
58	1/2"x1 1/2" Fillister Hd. Cap Screw	Bolt Steel - Class "A"	9	" "
59	9/16"x1 1/4" Fillister Hd. Cap Screw	Rolled Bronze	72	" "
60	7/8"x2 3/4" Fillister Hd. Cap Screw	Bolt Steel - Class "A"	36	" "
61	7/8"x4 7/8" Stud-Castellated Nut	Bolt Steel - Class "A"	72	" "
62	1 1/2"x5 7/8" Stud-Castellated Nut	Bolt Steel - Class "A"	22	" "
63	1 1/4"x1 4 1/4" Bolt-Castellated Nut	Bolt Steel - Class "A"	2	" "
64	2"x8 3/4" Bolt-Castellated Nut	Bolt Steel - Class "A"	60	" "
65	3/8"x1" Flat Head Cap Screw	Bolt Steel - Class "C"	1	" "
66	1/2"x1 1/4" Flat Head Cap Screw	Bolt Steel - Class "C"	12	" "
67	2" Eye Bolt	Standard Forged Steel	See Note	" "
68	Ring Packing	Garlock No. 99 or equal 3/8" Sq.	20 Rings	" "
69	2 3/4" Spanner Wrench	Steel	See Note	" "
70	3 1/4" Spanner Wrench	Steel	See Note	" "
71	Crosshead Nut Wrench	Cast Steel	See Note	" "
72	Diaphragm Packing	Garlock No. 99 or equal 3/8" Sq.	100 ft. long	No Detail
73	1/4" Round Gasket	Rubber	20 ft. long	No Detail
74	1/2" Round Gasket	Rubber	24 ft. long	No Detail

Note:- Furnish one each of Parts 67-69-70 and 71 for each Item of Contract regardless of the number of Valves Specified.

LIST OF DRAWINGS

VALVE - SHORT BODY TYPE - STAND CONTROL

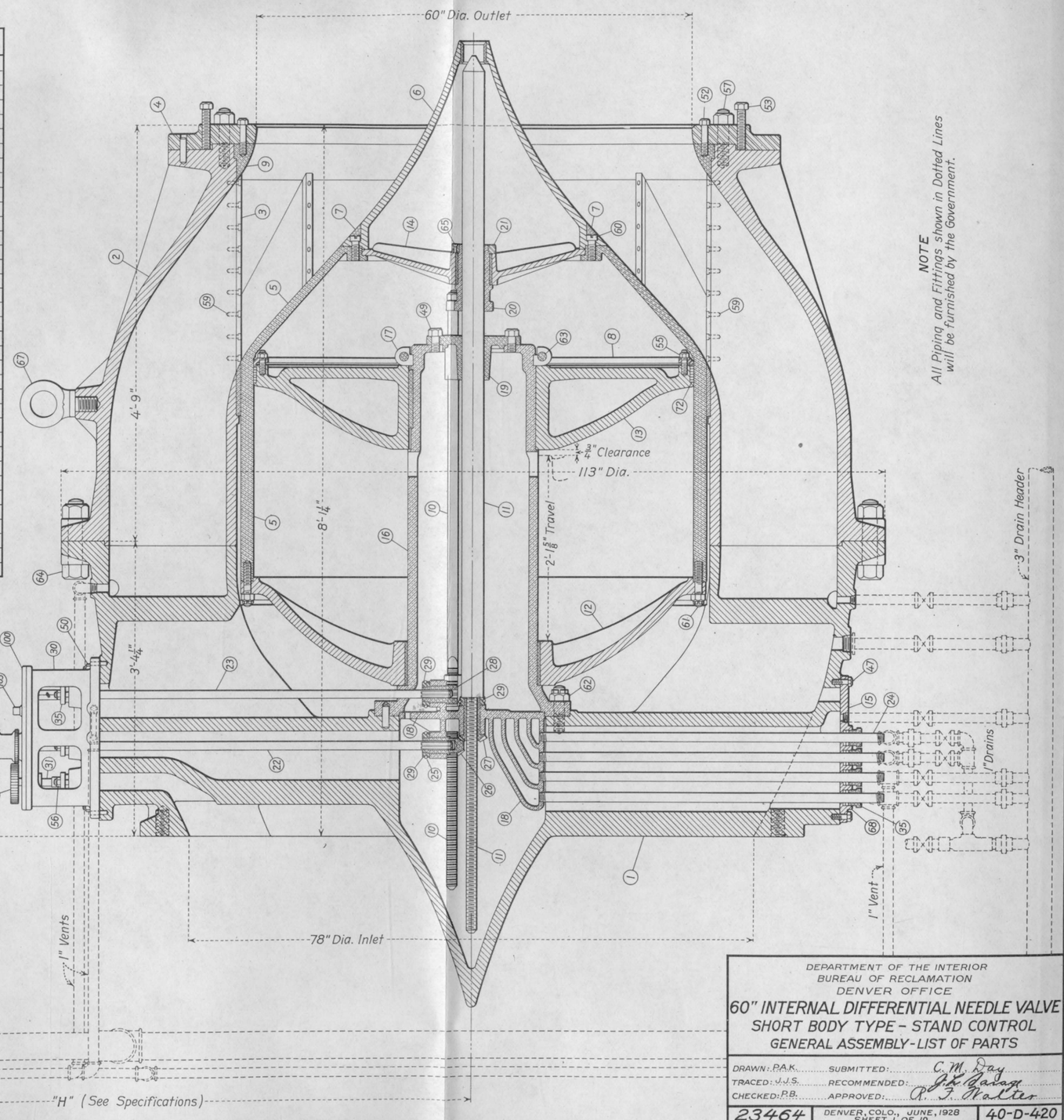
GENERAL ASSEMBLY - LIST OF PARTS 40-D-420
CONTROL ASSEMBLY - GEARS - COUPLINGS 40-D-422
LAYOUT DIAGRAM AND VELOCITY CURVE 40-D-424
SHORT BODY 40-D-426
NOZZLE AND SEAT RETAINER 40-D-427
NEEDLE - NOZZLE SEAT - PACKING CLAMP 40-D-428
NEEDLE HEAD - DIAPHRAGM - CONTROL SPIDER 40-D-429
DIAPHRAGM TUBE AND CLAMP - MANIFOLD 40-D-430
CONTROL HEAD - SHAFTS AND GEARS 40-D-431
BOLTS - STUDS - SCREWS - WRENCHS 40-D-432

VENT STAND

ASSEMBLY - LIST OF PARTS - DETAILS 40-D-433

CONTROL STAND

ASSEMBLY - LIST OF PARTS - GEARS 40-D-434
PEDESTAL - COVER - EXTENSION STEMS 40-D-435

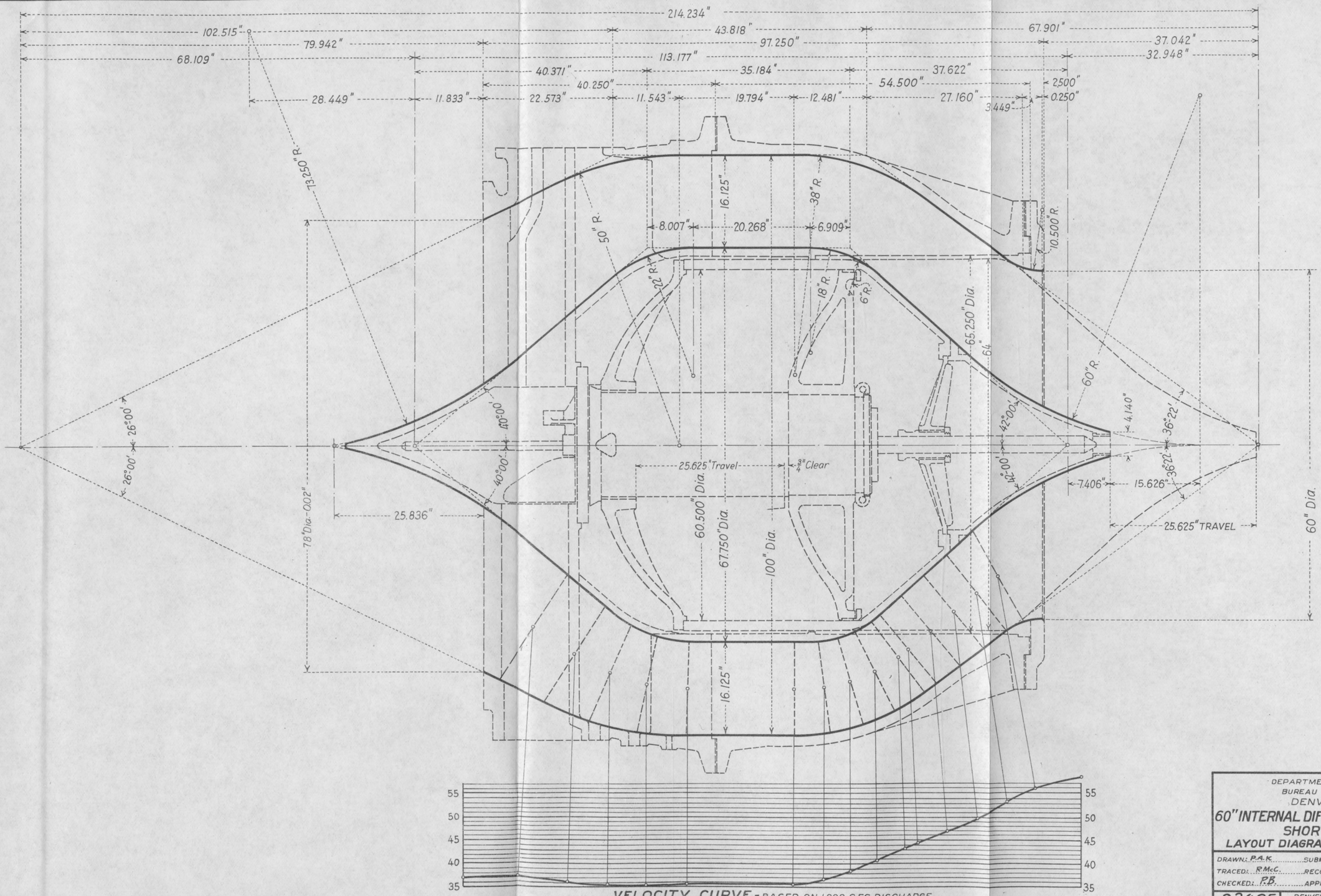


NOTE
All Piping and Fittings shown in Dotted Lines will be furnished by the Government.

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE
SHORT BODY TYPE - STAND CONTROL
GENERAL ASSEMBLY - LIST OF PARTS

DRAWN: P.A.K.	SUBMITTED: C. M. Day		
TRACED: J.J.S.	RECOMMENDED: J. L. Savage		
CHECKED: P.B.	APPROVED: A. J. Walter		
23464	DENVER, COLO., JUNE, 1928 SHEET 1 OF 10	40-D-420	



VELOCITY CURVE - BASED ON 1,000 C.F.S. DISCHARGE

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE SHORT BODY TYPE LAYOUT DIAGRAM AND VELOCITY CURVE

DRAWN: P.A.K.	SUBMITTED: C.M. Day		
TRACED: R.M.C.	RECOMMENDED: J.L. Savage		
CHECKED: P.B.	APPROVED: R. J. Walter		
23465	DENVER COLO. JUNE 12, 1928 SHEET 3 OF 10		40-D-424

Drill and Spotface 60-2 1/8" Holes equally Spaced for 64

2"R.

24"R.

6"

84 1/2" Bolt Circle

109" Bolt Circle

6"

1 3/8"

2 1/8"

A

B

C

Core 1" Air Vents thru Six Ribs where shown in This View

48 - 2" Taps, 4 1/2 N.F. Threads 3 1/4" deep equally Spaced for 54

A

(1)

SHORT BODY

SEMISTEEL - ONE REQUIRED

10" 1 3/4" 13 3/4" 10 1/2"

0" 4 1/2"R. 16"R. 3"R. 16"R. 3"R.

1 1/2" 3" 1 1/2"

2 1/8" 5/8"

SECTION E-E

1 1/8" 1 1/4"

SECTION K-K

3'-4 1/4"

HALF SEC. B-B

1" Core 6"

3/4"

3/16"

1" R.

2" 4 1/2"

68.109"

4" 2 1/8" 4"R.

6" 2 1/4" 1" 2 1/4"

1" Core 6"

2 1/2" 3/4"R. 6 1/2" 2 1/2" 3 1/4"

HALF SEC. C-C

1 3/8" 1 1/4"

SECTION J-J

1" Dia. x 3" Steel Dowel Pin Drive in Tight

2 1/4" 2 1/4"

24" Bolt Circle

2 1/4" 2 1/4"

22-1 1/8" Taps, 6 N.F. Threads 2 1/4" deep at Ribs equally Spaced from dimensions given for 62

SECTION D-D

15" 1 3/4" 12 1/4" 11 1/4"

6"R. 16"R. 3"R. 16"R. 3"R.

1 1/2" 3" 1 1/2"

1 3/8" 5/8"

SECTION G-G

12-3/4" Taps-10-N.F. Threads. 1 1/2" deep Spaced to dimensions given for 50

Drill, Ream for and provide 2-5/8" x 1 1/2" Steel Dowels with Control Mechanism Assembled.

1 1/4" 21"

6 1/2"

Tap for 1" Pipe

12" 3 1/2" 4" 4" 4"

30° 30° 30° 30°

K K

E E

D D

G G

H

J J

1 3/4" 4" R. 2" R. 2" 30° 9" 4 1/4" 10" 1/4" 13 3/4" 10 1/2"

5" R. 22 1/8"

26° 73 1/4" R. 78" 1 1/2" R. 91" 43 1/4"

1/2" 2" 28 1/2" 24" 8 5/16"

64 1/8" Rough Bore

Counterbore 27.000" deep 20 1/4"

3/4" 25 7/8"

1" Core for Drain 26° 30°

79.962" 40.371" 11.712" 22.553"

4'-2 3/4" 15" 3 1/2" 12 1/4" 11 1/4" 17.671"

65" 67 3/4" 100" Counterbore 101.500" 113"

Tap for 2" Pipe

13 1/2"

Groove for 74

1" 2" 4"R. 15/16" 3/4" 64

DETAIL H

SECTION A-A

1 3/8" 2 1/4" 3" 2 1/4" 3" 2 1/4" 2 3/16" 1" 3/4"

4.5" 45° 2 1/2"R. 3" 2" 4 1/2" 1 1/2" 2 1/2" 7" 6" 8"

13 1/2" 21 3/4"

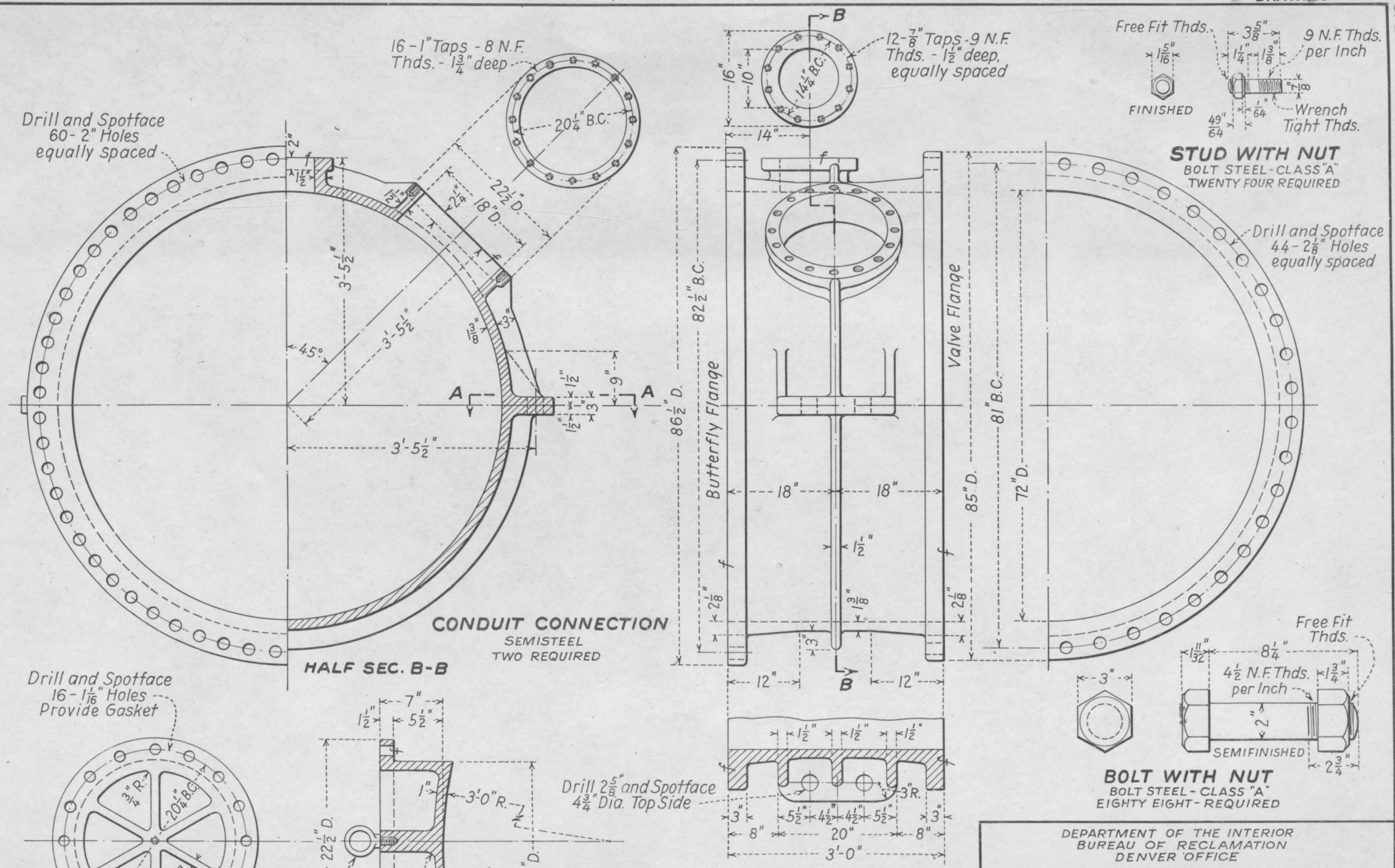
Tap for 1" Pipe

16-5/8" Taps-11-N.F. Threads. 1 1/2" Deep Spaced as shown for 47

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

60" INTERNAL DIFFERENTIAL NEEDLE VALVE SHORT BODY

DRAWN: P.A.K.	SUBMITTED: C.M. Day	
TRACED: A.A.A.	RECOMMENDED: J.H. Galaxy	
CHECKED: P.B.	APPROVED: A.F. Walter	
23466	DENVER, COLORADO, JUNE 1928 SHEET 4 OF 10	40-D-426



DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER OFFICE

U.S. INDIAN IRRIGATION SERVICE - SAN CARLOS PROJECT - ARIZ.

COOLIDGE DAM - OUTLET WORKS
72" CONDUIT CONNECTION

DRAWN B.H.S.	SUBMITTED	C. M. Day	
TRACED R. McC.	RECOMMENDED	J. L. Savage	
CHECKED R.O.H.	APPROVED	R. F. Walter	
23467	DENVER, COLO., JUNE 25, 1928	44-D-58	